CHEM. LIBRARY MAR 1 1922
Registered as a Newspaper.

CHEMICAL LIBRARY MAR 2 1922

GAS JOURNAL

LIGHT ✦ HEAT ✦ POWER ✦ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

Vol. CLVII. No. 3066.] LONDON, FEBRUARY 15, 1922. [74th Year. Price 1s.

OXIDE OF IRON
SPENT OXIDE

GAS PURIFICATION AND CHEMICAL CO., Ltd.
PALMERSTON HOUSE, LONDON, E.C.2.
Telegrams: "PURIFICATION, LONDON."
Telephone: 9144 London Wall.

B. 290
Aluminium
Sheets, Circles, Tube,
Wire, Strand,
Rod, Bar,
&c.
BRITISH ALUMINIUM CO., LTD.,
109, Queen Victoria St., London.

R. & W. HAWTHORN LESLIE & CO., LTD.
In Stock.
TANK LOCOMOTIVES
Always in Progress.
Locomotive & Marine Engineers & Shipbuilders,
NEWCASTLE-ON-TYNE.

"TORBAY PAINT"
FOR ALL PURPOSES.
The TORBAY PAINT CO.,
26/28, Billiter St., LONDON, E.C.
39/41, Old Hall St., LIVERPOOL.

BUY YOUR
COKE SACKS
Direct from the
WEAVER & MANUFACTURER
HERBERT POCOCK
PARK MILLS,
SALISBURY.
ESTAB. 1778.

INTERMITTENT VERTICALS.
Adopted all over the World.
Vertical Gas Retort Syndicate LTD.,
17, VICTORIA ST., WESTMINSTER, S.W.
Sole Agents for Australasia
JAMES HURLL & CO., LTD., SYDNEY.

W. PARKINSON & CO.
(Incorporated in Parkinson and W. & B. Cowan, Ltd.),
LONDON & BIRMINGHAM.
(See Advertisement p. 362).

JAMES McKELVIE & CO.
Coal Owners,
Gas and Steam Coal Contractors,
17, RUTLAND SQUARE, EDINBURGH.
59, MARK LANE, LONDON, E.C.
GUILDHALL CHAMBERS, SANDHILL,
NEWCASTLE-ON-TYNE.
24, CHAPEL STREET, LIVERPOOL.
ESTABLISHED 1840.

STEWARTS AND LLOYDS, LIMITED, 41, OSWALD STREET, GLASGOW. BROAD STREET CHAMBERS, BIRMINGHAM.
TUBES & FITTINGS for Gas, Steam, Water, &c.

George Glover's New
"Ranelagh"
Price-changer Pre-payment Gas Meter.
After the insertion of the coin, turning the handle automatically closes the slot. The mechanism is **silent in action**, a point of importance to the consumer.
GEORGE GLOVER & Co., Ltd.
Ranelagh Works, Royal Avenue, Chelsea, London, S.W.3.
Branches: 9, Dewsbury Rd., Leeds, & Gaythorn Meter Works, Manchester.

R. MITCHELL, FOR PATENT SLOT METER PAD & OTHER LOCKS. KENTISH TOWN, N.W.
R. & J. DEMPSTER, LTD., 34, VICTORIA STREET, S.W. 1. MANCHESTER.
Costs by using FERNDUR ELASTIC PAINT twice as long as other Paints.
BERMONDSEY, LONDON, S.E. 16.

J. & J. BRADDOCK

(Branch of Meters Limited),

GLOBE METER WORKS,

Telegrams: "Braddock, Oldham." Telephone 815.

OLDHAM,

AND

45 & 47, WESTMINSTER BRIDGE ROAD,

Telegrams: "Metrique, Lamb London." Telephone 2412 Hop.

LONDON, S.E. 1.

MANUFACTURERS OF HIGH-CLASS

GAS STATION METERS.

BRADDOCK'S

STATION GOVERNORS

AND

RETORT-HOUSE GOVERNORS.

IMPROVED

WET & DRY GAS METERS

OF BEST QUALITY.

BRADDOCK'S PATENT

"SLOT" METERS.

FULL PARTICULARS ON APPLICATION.

"LEAD WOOL"

Reg. Trade Mark.

PROVIDES BOTTLE-TIGHT JOINTS FOR HIGH OR LOW PRESSURE MAINS.

Is equally suitable for Steel or Cast-Iron Pipes. Its regular use will reduce unaccounted-for gas. The cost of the joint being less than with molten lead, capital expenditure is reduced.

Compressors Hired for Testing Mains. Competent Jointers sent out on reasonable terms.

When mainlaying is proposed, communicate with—

THE LEAD WOOL Co.(1919), Ltd.,

SNODLAND, KENT.

Telegrams: "Strength, Snodland." Telephone: Snodland 36.

THE GLENBOIG UNION FIRE-CLAY Co.

GLENBOIG

GAS-RETORTS, HORIZONTAL, INCLINED, and VERTICAL, to New Standard Specification.

WORKS: Ltd.
Glenboig, Lanarkshire.
OFFICES:
48, WEST REGENT ST., GLASGOW.

58 FIRST AWARDS At International and Home Exhibitions, including Grand Prize at Brussels, 1910.

In every case the highest award given for Fire Clay Goods.

The Glenboig Bricks, Blocks, and Retorts combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

B DONKIN D

DONKIN

for

HIGH-PRESSURE GAS PLANTS

ROTARY AND RECIPROCATING COMPRESSORS :: DISTRICT AND SERVICE GOVERNORS :: PATENT DOUBLE FACED VALVES.

THE BRYAN DONKIN COMPANY, LTD.,

Head Offices & Works, CHESTERFIELD.

LONDON OFFICE: 3, VICTORIA STREET, WESTMINSTER, S.W. 1.

Chesterfield Telephone No. 84.
London Telephone No. 5358 Victoria.

Chesterfield Telegrams, "Donkin, Chesterfield."
London Telegrams, "Donkin, Vic. London."

B CHESTERFIELD D

GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

PROPRIETORS: WALTER KING, LIMITED. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

Telephone: Holborn 6857. —— Telegrams: "GASKING, FLEET, LONDON."

VOL. CLVII., No. 3066.] WEDNESDAY, FEBRUARY 15, 1922. [74TH YEAR.

EDITORIAL NOTES.

Carbon Monoxide.

CARBON MONOXIDE in town gas has again been very much to the fore during the past week—mainly through pronouncements from the chairs of the two leading Gas Companies in the Metropolitan area. In accordance with the recommendation of the Departmental Committee who inquired into the question of whether it was necessary or desirable to prescribe any limitations to the proportion of carbon monoxide which may be supplied in gas used for domestic purposes, the Board of Trade have lodged the draft of a Special Order for the approval of both Houses of Parliament. It provides that " no gas undertakings, as defined by the Gas Regula- " tion Act, 1920, shall supply any gas for domestic purposes " containing carbon monoxide unless such gas possesses the " distinctive pungent smell of coal gas." This provision the British gas industry will accept freely; for there is no intention on its part to use anything but coal as the fundamental material for gas manufacture. Now that the carbon monoxide spasm has passed, the Daily Press, we incline to think, is under the impression that it has been somewhat fooled; that it was rather hypnotized by the names and eminence in science (if not in all practical affairs of life) of Prof. Bone and Dr. Haldane; and that the matter has not been viewed by it in proper proportion. The Daily Press ought at any rate to have appreciated that the gas industry would not do anything that would be destructive of its own interests.

Looking at the statements made last week in the order of their deliverance, the newspapers heard from Dr. Carpenter in his address to the proprietors of the South Metropolitan Gas Company, that carbon monoxide is not only distributed in the air by gas leakages where they exist (if people are foolish enough to allow them to do so, in view of the warning which the pungent smell of gas gives them), but in other ways. He particularly instanced the carbon monoxide distributed in our streets by the exhaust gases of motor vehicles. In a subsequent article under the heading of "Talking at Random," the carbon monoxide in the flue gases of coal fires is mentioned. In the lecture (also reported this week) by Mr. E. V. Evans, at the Society of Arts, he points to the carbon monoxide there is in tobacco smoke; and he urged the newspapers to retain a sane and balanced conception on the question of risk. The Governor of the Gas Light and Coke Company (Mr. D. Milne Watson) gave the newspapers something to ponder over in regard to this question of risk. As he pointed out, there has been no change in gas manufacture; and the percentage of water gas used in mixed supplies is practically that distributed before the war, and thus the percentage of carbon monoxide remains the same. What, too, of the following facts that the Governor presented for the information of those who so readily swallowed all that was said as to carbon monoxide? The fatalities due to gas do not exceed 2 per annum per million of the population; fatalities due to railways are 22 per annum per million of the population; fatalities due to street accidents in London are 100 per annum per million of the population of that city. Mr. Evans' plea for a sane and balanced conception on the question of risk is fully justified. By the way, he is a member of the Fuel Economy Committee of the British Association, of which Prof. Bone is the Chairman! But, chemist though he be, he totally dissented from the starting of this carbon monoxide hare. At his back is practical experience and daily association with the practical work of the gas industry.

From Troubled Times to Good Prospects.

LAST year the difficulties and troubles of the gas industry reached their apex; and the same year saw the beginnings of a descent to more composed conditions. It frequently happens that storm and stress are the heralds of a great calm. The gas industry hopes this is so now, and that from the present work may proceed uninterruptedly in re-building the fortunes of the industry so that the best possible service may be given to the public at the lowest possible cost, consistent with sound finance and a proper return on invested capital. When the Governor of the Gas Light and Coke Company and the President of the National Gas Council, being one and the same in the person of Mr. D. Milne Watson, looks out from his vantage-ground upon the future with a pleasure and optimism more conspicuous than they have been for some years past, then others whose horizon is not so large, whose opportunities for observation are not so great, and whose responsibilities are not so heavy, may from the fact take courage, or may in it find confirmation of their own similar views. When the proprietors of the Company on Friday last faced the Governor and a Board somewhat changed in its constitution, they heard from the former of the gigantic troubles of the past year, which troubles rolled upon the industry in succeeding huge waves, and seemed as though they would never flatten out and become smooth. Then they heard of succeeding conditions which spoke of a returning peace and of a gradual movement to more normal times and conditions. These are what are wanted to enable the work of restoration in the new circumstances to be attained.

The process of restoration, however, must be, and can only be, gradual. There are some people who think that in a complex business such as that of the gas industry, a fall in the price of coal alone should be succeeded on the morrow by a reduction in the charge for gas. A greater fallacy there could not be. Secondary products' values in 1920 had risen to an abnormal height. With a crash these values came down in the opening of the year 1921, and necessitated an advance in the price of gas. Trade depression set-in, which did not improve matters, but accentuated the difficulties. Then came the cap to it all in the long coal stoppage and the struggle by the miners for impossibilities. Every gas undertaking had its difficulties, perplexities, and anxieties in those three months of historic gravity. But if the difficulties and anxieties are measurable by business magnitude and the quantity of coal required, then those of the Gas Light and Coke Company, subject to the precautions taken against such a protracted event, must have far outweighed those of any other gas concern in the country, though the Company have such excellent support in their water-gas plants. Nevertheless, with all precautions, about half a million sterling in excess cost had to go in the purchase of foreign coal. However, it shows the wonderful resources of the Company, and the capacity of its administrators and executive officials, when the Governor can report that the supply of gas was continued without diminution of quality and pressure throughout the coal strike. That is something upon which to look back with pride. It is something for which the community should show gratitude; but if the gratitude is there, it is remarkably expressionless.

Those who showed their capacity for successfully dealing with such unprecedented conditions are the ones who are to day the subjects of attack by academical critics. They are supposed not to know their own business, or how to conduct it. They are possessed by such insensate folly that they would destroy a vast business and service (which give

so much current evidence of large expansion) by distributing a commodity that threatens the very life of the community, and by not adopting a system of carbonization which would supply oil as a primary product and gas as a secondary one! It will be seen from the report of the proceedings at the meeting that the Governor dealt with both these matters. Upon the first, what he had to say should reassure the community—should neutralize the injury and disturbance that men in position less responsible to the community than the Governor of the Gas Light and Coke Company attempted (perhaps unthinkingly) to occasion, but which action, judging from the current demand for gas, has had about the same effect upon the public as water has upon a duck's back. There has been no change in the composition of gas in normal days and in normal working. The carbon monoxide content of the gas to-day is just about the same as it was before the war. What changes there have been in this respect occurred more or less temporarily in the days of grave national emergency, and then nothing untoward happened. When examined in comparison with other daily risks, the Governor shows how low is the percentage of fatalities from gas per million of the population in contrast with railway and street fatalities. The answer is complete to allegation and to attempted incitement of public agitation.

However, following the coal strike, the wave of industrial and trade depression increased; but as a contra to this came a lowering of the price of coal and oil, which is an advantage to the gas industry. Then there has been that excellent piece of statesmanship on the part of the representatives of the industry and of the trade unions concerned in the labour of the industry, whereby the wages of the employees are now regulated by a sliding-scale based on the cost of living. Prices of plant, materials, and gas-using appliances have also declined; and the Company have revived the hiring-out policy, the popularity of which shows no diminution—in fact, what has happened since the resumption of hiring-out has proved how much the public welcome and appreciate the system. The proprietors of the Company heard from the Governor of these things with satisfaction, as well as of the beginning of reductions of price per therm to the consumers. In them, with the Governor, they see the turn of the tide, though one cannot possibly change completely in one sweep from such a heterogeneous mass of adverse conditions as were experienced last year. But that is what is expected by some people—certain daily newspaper writers among them—who are incapable of placing side by side, and giving due weight to, all the factors that influence the position. They want a prompt lowering of prices commensurate with the reduction of materials and labour. They know nothing of contras in the shape of market values of secondary products. They know nothing of the continuing influence of past high prices upon the position of to-day. We repeat that a material change in the matter of the price of gas must be, and it can only be, brought about gradually. But looking generally at the circumstances of the industry to-day, there is more promise in them than there has been during the past seven years or so. Given a large revival of trade, and so a fillip to gas consumption and to the demand for bye-products, the position of the industry and of its patrons will be improved. As the Governor declares, the industry is now prepared, and is waiting, for any demand that may be made upon it through a revival of industry and trade, which, supplemented by a reduction of taxation, will enlarge the spending power of the nation.

One other matter. The proprietors heartily approved all that has been done in respect of the filling of vacancies on the Directorate. We shall not be saying anything that will be regarded as invidious in remarking that the proprietors especially marked their gratification over the election of the Company's late Chief Engineer (Mr. Thomas Goulden) to a seat at the Board. The Governor, as an old colleague and from administrative position since, knows well the value of the services Mr. Goulden has rendered to the Company; and he acknowledged them in graceful terms and honest measure. He was warm in his welcome to Mr. Goulden from official state to that of directorial collaborator, though truth to tell there has never been any severance of collaboration from the old days to the present. There was also cordial greeting of the name of Mr. Thomas Hardie as the successor of Mr. Goulden in the chief engineership. In what the Governor said as to Mr. Hardie, there is conviction that coal is not the only good thing that comes from Newcastle, and that the Company have secured the right man for a post of immense responsibility.

Public Information from the Chair.

SHARE and stock holders of gas companies are largely representative of the public; and for the most part they are not gas technologists. Therefore speeches from the chair to them at annual meetings must, to be of any informative value, be of a character which they can well understand; and if the share or stock holders can understand the elements of such speeches, so will the public. This is an advantage which any trading concern the meetings of which are open to the Press should seek to gain. The address of Dr. Charles Carpenter to the proprietors of the South Metropolitan Gas Company last Wednesday was a model of one which makes good reading not only for the stock holders, but for the public at large. The year, of course, was peculiarly favourable to the supply of matters of public interest. It contained events in which every member of the community is concerned; and the degree to which an individual is concerned is multiplied enormously when one comes to deal with a large undertaking—especially one of the size of the South Metropolitan Company.

From the public and the stockholders' points of view, the year's management of the undertaking in South London has been a wise one. The coal strike found the Company well prepared. The Directors had realized that a stoppage of supplies would come; but no human being could have foreseen that the stoppage would have continued so long, and that over questions of policy which the major part of the people of this democratic country would not tolerate. The Company would have done better than they did in respect of extra coal cost due to the strike had not the authorities stepped in, and drawn upon their stocks for the supply of gas undertakings in less fortunate case. Coke, too, had also to be supplied for water-gas making; but this the Company could well do. But the prevision which made large provision of coal was (so to speak) forcibly discounted by the extractions from stock to go to the aid of the necessitous; and this in part accounts for some of the expenditure the Company had to make in the purchase of foreign coal at heavy cost. It is very noticeable that the President of the Company and his colleagues do not complain of this; but they evidently look upon it as one of the penalties of the Company's favourable situation. A considerable measure of satisfaction is found in the fact that they were able to give the consumers, throughout the stoppage, a full supply of gas of standard quality, though the extra cost of this has to be paid by the consumers. The consumers from July have had to pay 1d. per therm more; they will probably have to pay the same throughout the current half year. But on the ordinary stock no more than the basic dividend can be paid; while Dr. Carpenter says there is little doubt that, had there been no coal stoppage, the Board would have been able to pay a dividend little, if any, short of the pre-war rate. Consumers, stockholders, and employee co-partners therefore suffer loss, and fairly so under the new legislation applying to the Company, just as they will share in prescribed manner from increased prosperity. Their last two Acts have greatly simplified the Company's statutory obligations; but they have done something more—they have conferred larger protection upon those who are interested financially in, or who are employees of, the Company. These, as well as the consumers, will thoroughly endorse the President's protest against the proposal to apply the Corporation Tax to public utility concerns. Gas is to-day a necessary of life; and so many of the patrons of gas undertakings are of the poorer sections of the community. The commodity so valuable to them in easing their labour and in promoting their comfort is at a relatively high price now; but this cannot be helped until the costs of the coal strike are wiped-off, the coal in store purchased at a high price is cleared out, and there is such a revival in industry that secondary products are of better market value. Easier times will come; and it is important to the stockholders and the employees that the consumers' charges should come down at the earliest possible date.

Reference was made in our editorial columns last week to the good experience of the Company among the consumers in the matter of the transfer of charges from the basis of volume to that of thermal value. The President had more to say in his address to the stockholders on the fairness and usefulness of the system as affording a definite, uniform, and comparable basis when it is applied throughout the country—no matter what the calorific value may be per cubic foot. Wisdom frequently comes after the event. Dr. Carpenter's

new experience assures him that, if the change to the therm system had been effected before 1914, there would have been fewer grounds for complaint as to gas charges during the war and some part of the post-war period. We think there is little doubt as to this; and the view can be applied to the future. There is every ground for the belief that, when we can speak generally in terms of pence per unit, this will encourage greater satisfaction among consumers over gas prices than was the case when the charge was expressed in shillings for the large unit of 1000 c.ft., which was always rather a cumbersome one. Beyond this it is a purchase of quality; and, of course, gas in the future will be subjected to more rigorous testing. It seems fairly evident that Dr. Carpenter is not on the side of those who are sceptic of there being a successful issue to the exploration now being made to secure a reliable recording calorimeter. He says it is hoped that before long continuous recording calorimeters will be installed by the Gas Referees all over the country by which the quality of gas will be automatically recorded day and night. Meantime, the consumers in South London will be interested in learning how well they have been guarded when they read that from 6000 to 7000 official tests of their gas supply have been made by the authorities during the past year. There is assurance in the knowledge; but when it is found that this constant testing and official vigilance show that the Company have not failed in their statutory obligation—despite the coal strike—this cannot fail to enhance public trust in them.

Regarding the newspaper carbon monoxide campaign, Dr. Carpenter attacked this in a manner which should help to show that the attempt to raise public alarm so far as gas supply is concerned has no justification. The endeavour has been to incite alarm on not what is, but what may be; and even if the worst imaginable came about—the distribution of blue water gas containing (say) 35 to 40 p.ct. of carbon monoxide—there would be nothing to fear if pipes and fittings were in sound condition. As Dr. Carpenter says with the emphasis provided by alliteration: "It is meant to be "burned, not breathed." Moreover, as he further reminds, carbon monoxide is distributed far and wide over the streets from the exhaust-pipes of motor vehicles. And a point that the restrictionists cannot get over is that statistics have proved that the fears of wholesale troubles arising from its presence in some town gas supplies are, at any rate so far as Great Britain is concerned, unfounded. In the case of electricity supply, though the higher the voltage the greater the danger to life—and the common voltages of town-distributed electric energy to-day have been frequently proved to be fatal on contact—no restriction has been imposed. What has been done is outlined in Dr. Carpenter's statement, that it is a very remarkable fact that "unlike the "newer electric industry, which has had to formulate a "great number of rules and regulations to ensure the pro-"duction and distribution of electrical energy being carried "on with safety, this has not yet been found necessary "with gas." In the carbon monoxide and inerts investigations, Dr. Carpenter rendered distinguished service to the gas industry; and this he has supplemented on the present occasion.

Towards the end of his highly interesting address to the stockholders, the President referred to the new piece of experimental enterprise in which the Company are engaging. They are arranging to instal at their experimental works a process for purifying coal before it is converted into gas. The scheme is purely tentative. We know perfectly well that, if coal can have a preliminary cleansing or purification, the products from it—particularly coke—would have an enhanced quality. Whether, however, it will prove commercially successful is a matter which can only be determined by large-scale experiment. The South Metropolitan Company are going to utilize their resources in making the experiment. The gas industry will in due season learn the result—whether it is profitable or otherwise.

Gas Problems—Solved and Unsolved.

IN the gas industry there appears to be an almost inexhaustible store of problems for the chemist. Every avenue in its operations abounds with them; and when in any avenue one problem is solved, others arise. The gas chemist is to-day inalienably associated with the gas industry's work, and will become more so, for the simple reason that the industry cannot now progress without him, and his position to-day in promoting its welfare is equal to that of the engineer, even though there is not always substantial recognition of the fact. Engineers can construct, and some are good administrators and managers; but economies, the maintenance of high standards in processes, and advances in practices are now largely in the hands of the chemists. On Wednesday last, Mr. E. V. Evans, the Chief of the Chemical Department of the South Metropolitan Gas Company, lectured at the Society of Arts on "Some Solved and "Unsolved Problems in Gas-Works Chemistry;" and he drew to the famous old lecture theatre an audience such as few other official gas chemists could have done. The reason for this is to be found in the activity in gas research that has been proceeding for long at the Old Kent Road Gas-Works, and in which work Dr. Carpenter and his colleagues of the Board of the Company have given Mr. Evans and his staff all reasonable latitude, with the President of the Company taking a personal and advisory interest in it all. "Some" solved and unsolved problems. It would require a good many lectures to deal with all the chemical and physical problems that cluster about the operations of a gas undertaking; and so Mr. Evans compounded a lecture dealing with a few outstanding ones—currently polemical, or that show advance in solution, or have actually reached that happy state.

The lecturer entered practically without preface into the examples of solved and unsolved problems, laying it down, however, in his opening words that it is the duty of a gas undertaking to supply its consumers with a gas reasonably constant in composition and uninterruptedly adequate in quality. But before he finished, he also showed that it was the duty of a gas undertaking to supply not only its gas but its other commodities of reasonable constancy in quality, as well as to seek to make the best possible use of everything that is valuable that the process of coal distillation places at disposal. Naphthalene—which in the history of gas-works management has had many ugly epithets applied to it, which has also been described as elusive and inscrutable in its actions, which has caused no end of trouble to the responsible engineer—became at length a question for the chemist. And the result is that it does not to-day fall into the category of the unsolved. Gas technologists, Mr. Evans says, have been led astray in the past as a result of relying upon certain naphthalene vapour pressure determinations made by Allen in 1900. From those determinations, it would be inferred that wet coal gas at the freezing-point is saturated by 6 grains of naphthalene per 100 c.ft.; but recent investigation by Dr. J. S. G. Thomas has shown that this is incorrect, and that saturation is attained with only 0·8 grain of naphthalene per 100 c.ft. This makes a considerable difference. The capacity of a gas for retaining naphthalene is not solely determined by its inherent qualities or composition. It may one day retain the naphthalene; it may not do so the next day. Deposition, as the lecturer remarks, is influenced by the state of motion of the gas, the rate of change of temperature, and probably also by the nature of the other hydrocarbons present. In view of this, some technologists think that the naphthalene should be extracted from the gas; others that solvents should be so applied that the naphthalene is retained in the gas. Its retention is not much good to-day when luminosity of the gas *per se* is not a matter of importance. Extraction, however, cannot be effectively completed by washing with ordinary anthracene or heavy oil resulting from the distillation of coal tar, seeing that this oil, as ordinarily distilled, itself contains naphthalene. If, however, the oil be steam-distilled before use, and then applied systematically in a compartment washer-scrubber, finished extraction of naphthalene may be effected. Mr. Evans, it will be seen by the lecture, explains the process as applied at the works of the South Metropolitan Gas Company, at which something like 130 tons of naphthalene are extracted annually. Complaints are reduced, work is diminished, better pressures are maintained, and greater satisfaction generally prevails among the consumers. Apart from the market value of the naphthalene, there is a money value in these conditions, even though it may not be possible to assess them monetarily and completely.

Passing to purification, it was learned that Dr. Carpenter has within recent times considerably improved and simplified the nickel catalytic process. No particulars are yet available; but the hope of the gas profession will be that expressed by Mr. Evans, that Dr. Carpenter will, when the work is finished, communicate to the gas industry its nature. The ancient process of hydrogen sulphide purification came in for criticism on the two grounds (1) that it is a financial

burden, while the ideal would be that it should be a profitable system, and (2) that the physics of the process is wrong, in that a gaseous impurity at an initial concentration of 1 p.ct. by volume is extracted by means of a solid reagent. Research for an alternative process has left us much where we were. Oxide of iron still reigns supreme; but Mr. Evans arouses expectation of a coming supersession. A more hopeful line of exploration for the solution of this problem would appear to be in the use of oxidants in the cold. "The ideal oxidant should give, on reduction by means of "hydrogen sulphide of the gas, a soluble product capable of "easy regeneration to the original compound by the passage "of air through the solution. The sulphur would then be "the only material remaining out of solution, and could be "filtered off in a practically pure state." A fairly complete study has been made of organic and inorganic oxidants. Other processes that have from time to time been proposed for the displacement of oxide of iron do not present the simplicity of such oxidation reactions as those indicated by Mr. Evans in the lecture. It is hoped that before long it will be possible to report success along these lines—success effected either by inorganic or organic reagents. It is satisfactory to learn from the lecturer that the indications of to-day are not unfavourable.

The carbon monoxide question next received consideration; and though Mr. Evans has no intention of ceasing to indulge in the "fragrant weed," experiment has shown him that tobacco smoke contains appreciable quantities of the toxic gas—carbon monoxide. The points he makes here will be found highly interesting, and they were made in conjunction with the recent effort to stir-up agitation on the carbon monoxide content of gas. He took the opportunity of reminding us that to be alive is to be subject to a series of risks every day; and he later urged the Press and the public to retain a sane and balanced conception on the question of risk. The need for this has been very apparent of late. The public may not know it, but they have ample protection in the alliance of the gas industry with men of science—particularly at the Leeds University; and the Institution of Gas Engineers have shown themselves capable of conducting jointly with the University careful and comprehensive investigation into matters affecting the fundamental principles of gas manufacture. The public may have confidence that these bodies will continue to protect their interests in relation to carbon monoxide.

The lecturer started on the note that it is the duty of the gas industry to supply its commodities of a reasonable constancy in quality. An important contributor to this end is the coal itself. In Dr. Carpenter's address at the meeting of the proprietors of the South Metropolitan Company, he made an interesting reference to the experimental work they are undertaking in giving coal a preliminary cleansing and purification before being subjected to carbonization. Mr. Evans touched upon the same subject in dealing with the effect of clean coal in yielding products of consistent quality. This particularly applies to coke, which requires for its improvement the lowering of the ash content. For industrial purposes this would give it a better value by saving a large part of the labour costs of clinkering, and by promoting a greater efficiency of the plant in which it is used as fuel. Incidentally, Mr. Evans condemned the inadequate care given to the coke-cooling process. Many gas men have done this before. Nevertheless, in the main, the cooling of coke is continued by an indiscriminate application of water, so causing deterioration of the heating value of the material by excessive moisture, and rendering less stable its physical structure. There is the field for coke in domestic service; and this is a problem that should receive the attention of all gas men. It must be confessed that there is a good deal of truth in what Mr. Evans says that, however efficient the gas-fire and other gas-heating apparatus may become, there will always be a market for good solid fuel. And that market gas undertakings should seek to serve; for there would be no economy in setting-up another coal-distillation industry, as has been proposed by the low-temperature advocates. The problem of a suitable solid smokeless fuel has always been looked at from the high-temperature and the low-temperature carbonization points of view, and no others. Mr. Evans in his lecture corrects this narrow consideration of the subject. The first duty of gas-works is to make gas, and not oil—the latter is secondary to the main object. Further, the primary business of a gas undertaking is less speculative than its secondary business; and low-temperature carbonization would mean increasing the latter at the expense of the former. Moreover, low-temperature carbonization has yet to prove its commercial security. In a room adjoining the lecture theatre Mr. Evans had a fire burning, the smokeless fuel used for which was supplied by gas coke as the basis, with a binding material produced by the admixture of a proportion of cheap coal. The aggregate is heated by the temperature of the waste gases in the retort-house, which means the putting of waste heat to profitable use. The volatile content of the fuel is from 6 to 8 p.ct. The ash is the only drawback; but this it is hoped to reduce by the preliminary purification of the coal—if this proves successful and justifiable. There we have a new line of work suggested. Without question, every gas-works should be the central place of fuel supply for its district operation.

Other matters were dealt with by Mr. Evans in this lecture, every component of which contained interest. It produced a discussion, which, however, was largely constituted of expressions of opinion, but little in the nature of solid fact. Perhaps one reason for this was that few present previously knew the lines that Mr. Evans would take in his lecture. The cultivation of discussions which will have practical value is one of the problems yet unsolved by some of our scientific and technical societies. They trust too much to luck and fortuitous circumstance.

Talking at Random.

THERE is a great deal of nonsense spoken and written in the newspapers regarding carbon monoxide in town gas. A discussion has been proceeding in the "Glamorgan Free "Press" between Mr. S. Roy Illingworth, of the School of Mines, Treforest, and Mr. Harald Nielsen. It arose over a suggestion that the rotary retort system (described in our columns on Nov. 2 last) with which Mr. Nielsen is identified should be utilized to deal with colliery dumps. Mr. Illingworth has no objection to this, provided the gas is not used for town supply, owing to the proportion of carbon monoxide that it would contain—some 35 to 38 p.ct. Mr. Illingworth is keen on maintaining the health of the people. That appears to be his one and only point of view in moulding and supporting his antagonism to the distribution of gas containing a higher percentage of carbon monoxide than is ordinarily found in coal gas. But with all his fervour for this point of view, he does not, so far as we can see, give a thought to whether the health of the community would be improved by the provision of the cheapest possible supply of fuel gas, the progressive use of which would have a beneficial effect upon atmospheric sanitation, and so assist largely in promoting the health of the community.

The study of this matter by Mr. Roy Illingworth strikes us as having been on a narrow basis; and in one of his introductory statements in the controversy between himself and Mr. Nielsen, he publishes an error, which is a bad start. He says a recent semi-official enactment limits the amount of carbon monoxide in town gas to 20 p.ct. There has been no "recent semi-official enactment;" there has been no limitation whatever. What a Departmental Committee has found is that there is no evidence of ill-effects under the conditions of the distribution of gas and modern methods of using it to justify the imposition of any limitation. He seems to be under the impression that this phantom semi-official enactment is based on the relative number of deaths per million of population where coal gas is consumed and where gas containing much carbon monoxide is in use. In this connection, two things may interest Mr. Roy Illingworth. The first is that the mixture of coal and water gas that is now being largely distributed in the country contains less than 20 p.ct. of carbon monoxide, as he can see for himself when he learns that the very common practice is to proportion the mixture so that it contains only from 20 to 33 p.ct. of water gas. Then it was water gas, with its (say) 36 to 40 p.ct. of carbon monoxide, that helped so magnificently to keep the country supplied with fuel for domestic purposes during the coal strike, and during the shortage of coal in the time of war.

Where Mr. Illingworth talks very much at random is in asserting that small traces of carbon monoxide arising from supposed leakages in gas-pipes are detrimental to the health of the community. Men in a far better position than Mr. Illingworth to judge as to whether the supposition has any reliable foundation in fact have, when questioned, to declare that they have no certain evidence that this is so. The hypothesis is only based on the knowledge that it would be so if the leak existed. But where there is common

sense, there are no gas leakages; and there cannot be a leakage of town gas without its presence is perceptible. There is danger to life in many of our modern conveniences. It is only by the application of individual common sense and precaution that the already appalling death-roll through railway and street accidents is not rendered more appalling still; but no one dreams of restricting mechanical transport. There is considerable danger to life in the common voltages of electricity supply, and in the propensity to short-circuits which put life and property into serious peril; but no one thinks of staying the advance of the use of electricity for this. A few extremists on this carbon monoxide question, however, would stay progress in providing a cheap supply of gaseous fuel, which would have such a beneficial effect on the health of the people by maintaining a greater purity of the air and lightening the drudgery of domestic life.

However, Mr. Roy Illingworth goes on to warn us that we ought not to gauge the health of the community by counting the "dead-uns" (this is not particularly refined), but by gauging the "A," "B," and "C_3" people. He airily says that much carbon monoxide in gas will make for C8 people. What evidence has he that this is so? If he has any which shows positively that modern methods in gas supply and use have made for C_3 people let us have it. If he has not such evidence, then why take the *rôle* of a public alarmist without a cause? Generalities do not make a case; and generalities can be very unjust. Has Mr. Illingworth counted the millions of people who live, and have always done so, in houses in which gas-pipes are in every room—gas in which carbon monoxide has always been present—and a great proportion of which people have for years used gas in which there is a percentage of water gas? From those homes came the "A" and the "B" men—men born and reared in gas-using homes—who went and fought our battles. Why were they not the sufferers from all those ills which Mr. Illingworth catalogues as arising from traces of carbon monoxide? Speaking of traces of carbon monoxide in the air we breathe, as Mr. Nielsen points out, it is no uncommon thing to find in the flue gases of kitchen ranges and fire grates some 4 p.ct. of carbon monoxide which is discharged into the atmosphere, and where there is a defective chimney draught often into the room. And into our streets to-day motor exhaust gases are discharged which also contain a percentage of carbon monoxide. Yet with the carbon monoxide in town gas, that in the flue gases from coal fires, and that in the exhaust gases of motor cars, we are not a C_3 nation. Our war record not only at the front but in munition factories proved this. For goodness sake do drop assumption and hypothesis, and look at facts fairly and squarely and fully in the face, and not let bare notions get exalted to the position that should be occupied only by incontrovertible facts. Advance and evolution must continue in every sphere of life. Advances have been made in the methods of utilizing gas which not only result in greater efficiency but in greater security. We harbour no idea that the end has been reached in this respect. "Dead-uns" and "C_3" people! We do not like to see our scientific men playing to the gallery.

"The Gas Salesman."

The second number of "The Gas Salesman" will be issued with next week's "JOURNAL." As on the last occasion, additional copies will be printed, for separate purchase and distribution among sales staffs. The demand for the additional copies last month exceeded our expectations, and this is good evidence of the interest taken in the new venture. All final communications for this month's "Salesman"—news items and advertisements particularly—should reach this office not later than the first postal delivery next Monday morning.

Gas Light Dividend.

We regret very much that a misreading of the report of the Directors of the Gas Light and Coke Company, led in our editorial comments last week to a wrong statement as to the dividend for the past year. The interim dividend was the same as that proposed for the December half—£4 13s. 4d. p.ct. Each half year also contributed £10,000 to the redemption fund.

A Bold Circular Inquiry.

The Borough Engineer of Merthyr Tydfil must have put his tongue in his cheek when he sent out a circular of inquiry on the 8th inst. We should like to describe the circular in appropriate terms; but, if we did so, he might not think them courteous. The circular seeks information which gas undertakings are not in the habit of divulging other than in response to the call of Government Departments for returns, or for purposes that are beneficial to the interests of the gas industry. The particulars sought for it is pretty obvious are only needed for one purpose; and so we hope that the Borough Engineer of Merthyr Tydfil has not had any satisfaction from the circular. There is no necessity to say more than that the circular reads as follows: "I shall be much obliged by your sending me the following particulars regarding the gas coal purchased by your authority (or company) for the manufacture of gas: (1) Name of authority or company. (2) Quality of coal, and where obtained. (3) Price per ton delivered at railway station. (4) Price per ton delivered at works. (5) Is this price a contract figure, and, if so, for what period? (6) Kindly give date of contract. (7) If you have no contracts, do you buy in the open market? (8) Quantity of coal purchased per annum. (9) Total manufacture in cubic feet per annum. (10) Is your company a statutory one? (11) Price charged per 1000 c.ft. or per therm. (12) Declared calorific value." Those are the questions. Every reader is at liberty to describe the circular as he pleases. One correspondent gives a lead. He says: "The refreshing assurance and cocksureness of the whole business are of those things which too seldom gladden us in this drab world."

Coal Purification.

The South Metropolitan Gas Company are going to make an interesting trial, apparently on a fairly large scale, at their experimental works, of the effects of cleansing and purifying coal before carbonization. The matter was referred to by Dr. Carpenter in his address to the proprietors of the Company last Wednesday, and Mr. E. V. Evans incidentally alluded to it in the lecture he delivered at the Society of Arts the same evening. There can be no question that the preliminary cleansing and purifying of coal would have a good effect on the efficiency and product results of the carbonizing process. The question to be decided is as to whether the proposition is economically sound. The Company are proposing to find the answer. Until they ascertain it, they are not going to say whether the scheme is right or wrong.

The Price of Gas.

All in the gas industry are agreed that the price of gas is higher than we like to see it. The quicker it comes down, the sooner will our gas dividends be higher, and the better pleased will be all gas shareholders. But the price cannot be reduced with a run, though the "Pall Mall Gazette," omniscient and wonderful, refers to "the excuses" made for the fact that gas has not fallen substantially in price as being "ridiculously inadequate." We need not explain here the ignorance of the "Pall Mall Gazette;" but every gas man will see a double confession of it in the following sentences from a recent editorial in its columns: "What we want to know is why, with the cost of raw materials and wages falling, the price of gas is maintained. We also take great exception to the substitution of the mysterious 'therm' for the old cubic foot as the basis of price. The meter still registers by feet—why translate them into therms, unless it is to hoodwink the public?" As to this question, the answer is that a therm is 100,000 B.Th.U.; and no matter how many cubic feet have to be consumed per therm, the consumer is only charged for a therm.

Summer Time.

The "Summer Time" Bill has been introduced in the House of Commons, and read the first time. The measure is to give legislative effect to the agreement reached between the French, Belgian, and British Governments; and it provides that summer time shall commence on the night of the last but one Saturday in March when the last Saturday is the day preceding Easter Day, and end on the night of the first Sunday in October. The three countries will thus begin and finish "summer time" together.

Transport of Coal.

Dissatisfaction has been growing over the recent concessions in the coal-carrying rates of the railway companies; and it does not appear that the Railway General Managers' Committee will

have much peace from the Mining Association until there is further reduction. The two bodies have had another interview; and the coalowners have pressed for the total abolition of the flat rate, a reduction in dock and shipping charges, and a general percentage reduction to act uniformly. The railway companies replied that high costs and diminished traffic are obstacles to compliance; but they expressed sympathy, and promised that the application should have careful consideration.

Gas Coal and Coke Markets.

Different coal areas have been having different experiences during the past week regarding gas-coal business. In some districts there has been a falling-off in the demand for gas coal; while in others, particularly in Durham, Northumberland and Yorkshire, there has been quite a brisk demand. This latter is no doubt due to the export business of those areas combined, with the home demand. The largest inquiry continues to be for the best and screened qualities, in pursuit of the policy of gas undertakings at a distance from the fields to save the heavy conveyance rates on the additional amount of second-class coals which would in comparison be required. Hence, the reports as to a temporary scarcity of the better qualities, and of a continued firmness of price. In the export areas a considerable business is being done in gas coke and patent fuel; and, as supplies of the former are available, clearances are quickly effected. But from some other areas it is learned that the demand for gas coke shows a drooping tendency, and so do prices. These conditions are, of course, anything but general.

PERSONAL.

Hearty congratulations were, at the meeting of the Newport (Mon.) Gas Company, extended to Mr. T. H. HAZELL, the Secretary, on his completion of fifty years' service with the Company; and these congratulations will be joined in by the members generally of the gas industry, among whom Mr. Hazell is well known. Mr. Hazell has seen many great strides made by the Company; and we hope that he may be spared to see many more. In 1900 he became Secretary of the Company; and during his fifty years' connection with the undertaking, he has seen its business and revenue increase by sixteen times. At the meeting, many eloquent tributes were paid to his magnificent services.

OBITUARY.

Northamptonshire lost a "grand old man" on Thursday, the 2nd inst., when Mr. JOHN T. STOCKBURN, J.P., passed away, at his residence in Kettering. Nearly 97 years of age, the deceased gentleman had been a Director of the Kettering Gas Company ever since 1857, and Chairman for the past three decades and more. One of his sons—Mr. Richard W. Stockburn—also has been a member of the Board for some considerable time. Touching life at many points, the deceased gentleman was an ardent politician, a keen and prosperous man of business, a lover of various forms of sport, greatly interested in literature and art, and a generous philanthropist. One of the founders of the Kettering and District General Hospital, he was ever a most generous supporter of that institution. He had as much to do as anyone with giving Kettering an adequate water supply, and was Chairman of the old Water Company when the Urban District Council purchased the undertaking for the town.

The death took place last week of Mr. RICHARD H. JEPHCOTT, at Great Alne, near Alcester. Mr. Jephcott was a native of Alcester, and was Chairman of the Alcester Gas Company.

Southern Association of Gas Engineers and Managers (Eastern Section).—The next meeting of the Eastern Section of the Association will be held on Tuesday, Feb. 21, in the rooms of the Institution of Gas Engineers, No. 28, Grosvenor Gardens, Westminster, at 2.30.

Eighty Years' Gas Lighting in Toronto.—On Dec. 28 last, Toronto celebrated an anniversary of importance; for on that day eighty years ago gas lights first made their appearance in the city. To celebrate the anniversary, the Toronto Consumers' Gas Company announced that a reduction in the price of gas would be made early this year, should conditions be found to warrant it. When the Consumers' Gas Company first took over the lighting system in Toronto in 1848 from Mr. Albert Furness, the citizens had been using gas for lighting purposes for seven years. There were at first 817 customers on the Company's books; and there were 164 street lamps in the city. The yearly output was 5,834,000 c.ft.; and the price was $5 per 1000 c.ft. To-day the Company have more than 128,000 customers; and the output of gas is over 5,000,000,000 c.ft. per annum.

ELECTRICITY SUPPLY MEMORANDA.

THE King's speech, at the opening of the new session of Parliament, does not foreshadow a lengthy legislative programme. The keynote is the need of economy in every direction. The reduction of public expenditure has considerable prominence; and relief from the heavy burden which now rests upon "our citizens" has magnificent promise. Emphasized, too, is the necessity for practising economy by all and in every direction. Furthermore, a Bill is announced which is to substitute a yearly audit for a half-yearly one in the case of Rural District Councils and Boards of Guardians, as well as other measures framed "to give effect to the policy of retrenchment." A general election is in sight; and the banner of "anti-waste" will be unfurled in every constituency. In certain sections of the electricity supply industry, the display by the Government of so much firmness and comprehensiveness in respect of an economy policy will be distasteful. They want passed into law No. 2 Electricity Supply Bill in order to enable the financing of the large new schemes of reorganization and concentration of electricity generation. But there is an equal array of antagonists in the industry, who much prefer to work out their own salvation by developing local schemes from the present state of things as and when opportunity arises. They have a decided bent for natural developments rather than for the inflations that they believe would be produced by revolutionary ones. The Government, too, are well aware of a massed opposition of financial and industrial men outside the industry. They cannot adopt a policy of economy "in every direction," and at the same time sanction the expenditure of millions of money on a reorganization which the finances and the industrial position of the country do not justify. Thus the outlook for the No. 2 Electricity Supply Bill does not appear more favourable now than it did when it was re-introduced last year. In fact, the additional time has simply enlarged and made more compact the hostility to the measure.

An Economy Policy.

Playing the Game.

Before the newly-formed Contractors' Society in Glasgow, Mr. R. B. Mitchell, the Corporation Electrical Engineer, has been discussing the question of "Electric Supply Undertakings and the Domestic Load." The object of the paper was apparently to energize the contractors to a greater interest in doing their part to promote the domestic load—a field of activity, enterprise, and wealth which lies at their very doors. At any rate, this is what we gather from the paper. The Glasgow electrical contractors are evidently oblivious of this, as it required Mr. Mitchell to inform them of it. A good deal has been said lately as to "playing the electrical game." The electrical game seems to be that supply engineers, manufacturers, and contractors should do all they can individually and collectively to foster the development of the domestic electricity load. That is a very wise thing not only for the constituent elements in the electrical business, but for the constituent elements in the gas business. The more each and all can do, the greater will be the advantage that each and all of the interested parties will derive. There seems to be too much disposition on the part of some supply engineers, manufacturers, and contractors to operate with the object of getting the largest possible immediate pull out of work, instead of regarding the electricity business as a whole, and looking not only to immediate returns, but to ensuring that present doings shall help to promote business in the future. Mr. Mitchell is keen on "playing the electrical game;" but in the account of the paper before us, it does not present him as being altogether keen to play the game where his chief rival is concerned. He says "the attention being given to the constituents of present-day 'coal gas' by the newspapers will surely rouse the public to a realization of its deadly qualities, and create an even greater demand for its healthy and cleanly rival electricity." The constituents of present-day coal gas are very similar to what they have always been. Where there is a mixture of coal gas and water gas, the proportion of that valuable heating constituent carbon monoxide is somewhat increased compared with coal gas; but, in most gas-supply areas, its total percentage is then well within that recently proposed by Prof. Bone and Dr. Haldane. We suggest to Mr. Mitchell that he should read our editorials on the subject published in the "JOURNAL" for Jan. 11, Jan. 18, and Feb. 1. Meanwhile, it strikes us as a little strange that the chief electrical official of a Corporation possessing a huge gas undertaking should speak in such strong terms in depreciation of its primary product. However, the reference in the paper shows how delighted the electrical people are to have the ancient carbon monoxide bogey to support them to cultivate their own business. They must be terribly hard-up for substantial merit of their own, or their difficulties and drawbacks are so many that they require the help of ignorance and human folly to assist them to get trade.

Heating and Cooking Loads.

The development of the domestic load would, says Mr. Mitchell, be to the advantage of any undertaking. The statement should be qualified. The domestic load may be a diversified one; or it may not be. Mr. Mitchell declares it is for the most part an off-peak load; and for that reason will not require the provision of extra plant. What of room

heating? Supposing electricity was largely adopted for general heating, which is a supposition that requires the application of an extraordinarily strong imagination. Room heating is most required in the worst and coldest of weather. It is then a continuous and a general need: and so, if electrical energy was used, it would not be an off-peak load. But it would be a load that would come on the highest peak of winter; it would be a pure seasonal demand. The plant for it would not be required precisely at the same time that there is a low lighting demand for six months of the year. We do not agree that, in these circumstances, the capital charges to be set against the domestic load would be very small, so that a favourable rate might be quoted for energy to be used for domestic purposes. In Glasgow, the Electricity Department is attempting to do something to develop the domestic load. It has a Special Propaganda Committee; and on their proposal 200 electric-cookers have been purchased for hiring purposes. When these are hired-out, Mr. Mitchell hopes the good work will be allowed to continue. He did not give any information as to initial and installation costs, nor as to hiring rates; or at all events the report under review does not show that he did so. However, within three weeks of the announcement of the hiring service, applications had been received for all the cookers available. What are so few among such a population as Glasgow? Mr. Mitchell states that "some" of the cookers have now been installed; and experience with them so far has been very satisfactory. If experience is not satisfactory when the apparatus is new, when will it be? Not when it is older, and the heating-oven elements have a fine integument upon them of burnt grease, and those on the hot-plate have deteriorated through the spillings from the utensils on the hot-plates. Supposing, by again stretching the imagination that the electric cooking load reached the dimensions of that of the gas undertaking, and the peak of demand (as in the case of most gas-works) came at the time of the preparation of Sunday dinner, would any electricity station be able to supply on the necessary low terms? We think not. And would they be able to stand that strain, without incurring a considerable amount of expense for enlarging the distribution system?

Deterrents.

Then Mr. Mitchell acknowledges that a great deterrent to the use of electricity for purposes other than lighting is the fact of its not being better known and trusted sufficiently. Perhaps the statement should have been put in the opposite way—that a great deterrent to the use of electricity for domestic purposes other than lighting is the fact that its inherent weaknesses and costs are so well known, and that people have had so many unpleasant experiences that little trust is reposed in its reliability and heating value. He then proceeded to urge that people must be shown what electricity can do, and what it costs to perform various services. So far as those services go in which we are particularly concerned, people have been shown what electricity can do, and what it costs; and in the knowledge gained and circulated, there is one of the greatest deterrents to the progress of electricity. We do not deny convenience for certain small purposes; but for certain larger ones, we do assert that the essentials of economy and efficiency are of a low order compared with competitors. We get an indirect confession of the shortcomings in respect of both economy and efficiency when we read that where "moderate rates" are obtainable for electricity, "a combination of coal and electricity" will displace gas progressively, assuming that reasonable arrangements are made for letting people have the necessary apparatus on easy terms. There we see that electricity requires to be propped up by coal, that the electricity must be at moderate rates, and that the apparatus must be available on easy terms. We quite agree. The knowledge of commercial difficulties resides with Mr. Mitchell as with many other electrical men; but it is not his or their business to make anything more than an indirect acknowledgment. If the cooking and heating load cannot be developed to any substantial extent in Glasgow, then it cannot be done anywhere. But really we would suggest to Mr. Mitchell and other electrical men that they should not rely, especially in respect of cooking apparatus, upon their own experiences, seeing that they are gained under specialist surveillance, which does not and cannot obtain in any ordinary household. It is the ordinary household which provides that domestic field of which Mr. Mitchell speaks; it is in the ordinary household electrically operated where the officials of gas undertakings hear so frequently the tales of woe concerning experiences, and where they secure many new orders for gas-heated apparatus.

Midland Junior Gas Association.—At a meeting of the Association last Thursday, in the Council House, Birmingham—Mr. L. H. Thomas (the junior Vice-President) in the chair—a paper was read by Mr. Luke Sturdy, of the Birmingham Corporation Gas Department, on "Canteen and Restaurant Equipment." Pressure compels the holding over of our report of the proceedings at the meeting.

Yorkshire Junior Gas Association.—At a meeting of the Association to be held next Saturday afternoon at Leeds University, Mr. S. T. S. Musgrove, of Sheffield, will read a paper on "Selling Gas by Therms." He will deal with the importance of the selling side, instruction to the selling staff, improvement in appliances, the domestic side, advertising, showrooms, the industrial side, complaints, and maintenance.

CARBON MONOXIDE.

A Special Order and a Pungent Smell.

The following is a draft of a Special Order proposed to be made by the Board of Trade under section 2, sub-section (4), of the Gas Regulation Act, 1920, "limiting the proportion of carbon monoxide which may be supplied in gas used for domestic purposes."

Whereas, in pursuance of the provisions of section 2, sub-section (4), of the Gas Regulation Act, 1920, the Board of Trade have caused an inquiry to be held into the question whether it is necessary or desirable to prescribe any limitations of the proportion of carbon monoxide which may be supplied in gas used for domestic purposes;

And whereas upon such inquiry it appears desirable that an Order in the following terms should be made;

Now, therefore, the Board of Trade, in pursuance of the powers conferred upon them by section 2, sub-section (4), of the Gas Regulation Act, 1920, and of all other powers enabling them in that behalf, hereby make the following Order:

1. This Order may be cited as the Gas (Carbon Monoxide) Order, 1922.
2. No gas undertakers as defined by the Gas Regulation Act, 1920, shall supply any gas for domestic purposes containing carbon monoxide unless such gas possesses the distinctive pungent smell of coal gas.

CORT'S ANTI-DIP.

Under the title "More Therms Per Ton," a prominent gas engineer has written an article which has been reproduced in pamphlet form by Messrs. Robert Cort and Son, Ltd., of the Kennet Iron-Works, Reading. In this, the writer says that, in his judgment, the ideal conditions for carbonizing are provided by working with neither pressure nor vacuum in the retort throughout the whole period of carbonization (that is, at level gauge), or with a very slight vacuum. Retort-house governors have made possible such close regulation of the pull that it is possible to work, with an ordinary hydraulic main, with the level of the liquor lowered so as to unseal the dip pipes; and this is a practice which has been adopted at some very large works. He, however, prefers to use Cort's anti-dip valves, with which every possible contingency can be met.

With this apparatus, the writer goes on to explain, each retort is individually sealed by lowering the sliding sleeve into the liquor in the hydraulic main. This arrangement ensures absolute safety when the retort is open, because, the seal being removed immediately the retort has been charged, it can be set to as much as 1 in., so that no fluctuation of the liquor level can unseal the retort and permit the air to be drawn up the pipe, or gas to come down it. A retort off for scurfing can be sealed off by simply dropping the sleeve in the same way, and can be left open all night with safety. Another great advantage of the system is the fact that any retort which may be leaky, having been just scurfed or nearing the end of its life, may be worked with a seal, if desired. A further recommendation of this anti-dip is the fact that it is never necessary to vary either the level of the liquor in the mains or the pull in the foul main; and therefore nothing is left to the initiative of the man in charge.

The hydraulic main being worked in the ordinary way connected to a tar tower, the condensed tar falling down the dip pipe drops into the liquor in the main and settles to the bottom, whence it flows to the tar tower. The evils of pitched mains are therefore no more likely to happen than with an ordinary hydraulic main. As regards stopped pipes, the avoidance of oscillation in the pressure in the retorts and of over-pulling would reduce this trouble; but it cannot, the writer adds, be definitely stated in all circumstances that anti-dips will cure this admitted evil. It can, however, be stated with confidence that, with heavy charges and two ascension pipes to each 29-ft. retort, the stopped pipe trouble may be completely overcome, provided the retorts are worked without seal and at about level gauge. Unsealing the dips makes all the difference to the working of the two pipes. As to Cort's anti-dip itself, the device is simple. The working parts do not depend for tightness on faced joints, and are not in the path of the hot gas.

One of the good results of the new method of charge by the therm, the author of the article points out, is to render comparisons of all kinds more scientific and more readily understood. Whether the adoption of anti-dips means an increased yield of gas in cubic feet, depends on conditions. It, however, can be confidently stated that the system renders possible increased thermal efficiency—that is, the production of more therms from a ton of coal; and also it makes possible a high yield of therms, together with low inerts in the gas. The writer is as sceptical as most of his confrères about marvellous inventions which will do anything and everything, according to their sponsors; and before accepting any statement that is made as to the improvement to be derived, he desires to know where the something extra is to come from. Briefly, by this system less gas is lost through the pores of the retorts, leakage at the lids, &c., and less gas is lost through stopped pipes. Less air and furnace gases are drawn in to reduce the calorific value and add to the inerts.

THE NEW GLOVER-WEST VERTICAL RETORT INSTALLATION AT FALKIRK.

THE official inspection and inauguration of the new Glover-West vertical retort installation at Falkirk, which has now been in operation for several months, took place on Thursday afternoon last, the 9th inst., in the presence of the Provost and the Convener of the Gas Committee, members of the Council, and a number of gas engineers and visitors.

FEATURES OF THE PLANT.

The installation of Glover-West vertical retorts replaced a horizontal retort plant which was built in 1905. Originally, there were twelve settings of eight horizontal retorts, 21 in. by 16 in. by 20 ft. through; but since then seven of them had been converted to settings of twelve retorts each, and the remainder to nine retorts each, making a total of 129 retorts with a capacity of 1⅕ million cubic feet a day.

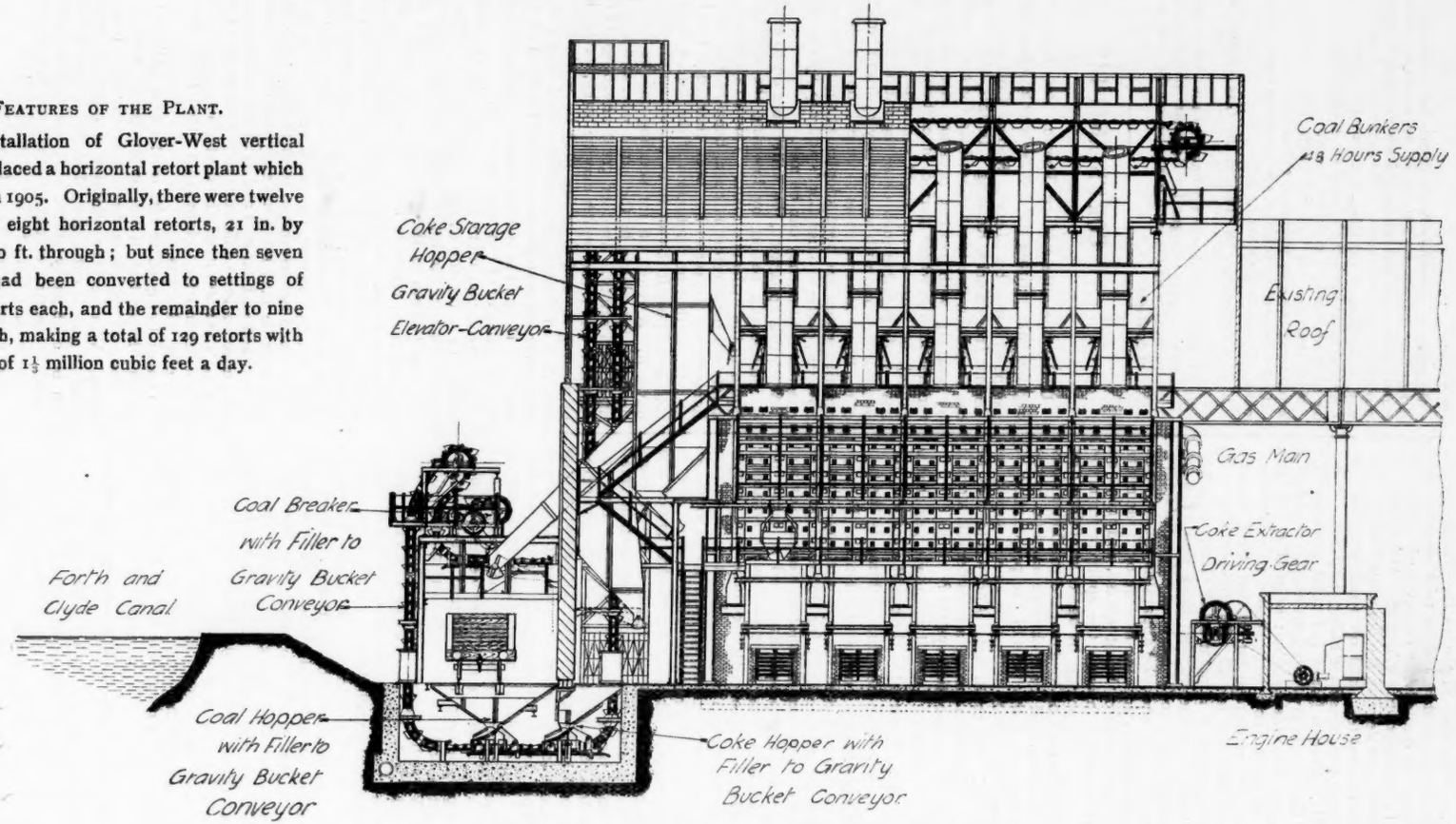

Coal Bunkers
48 Hours Supply
Coke Storage Hopper
Gravity Bucket Elevator-Conveyor
Existing Roof
Gas Main
Coke Extractor Driving-Gear
Coal Breaker with Filler to Gravity Bucket Conveyor
Forth and Clyde Canal
Coal Hopper with Filler to Gravity Bucket Conveyor
Coke Hopper with Filler to Gravity Bucket Conveyor
Engine House

FIG. 1.—LONGITUDINAL ELEVATION OF THE FALKIRK INSTALLATION.

The five settings of Glover-West retorts have been built in the space left at the canal end of the retort-house. While the proposition was evidently advantageous, it presented a number of exceptional constructional difficulties, which, however, have been successfully overcome. In the first place, the existing horizontal retorts had to be kept in operation, and their coal supply, across the space to be occupied by the new installation, had to be maintained. In the second place, the existing roof had to be cut through; one half of the span being left intact, and the principals being attached to the new structure as the erection of the latter proceeded. The coal conveyor was supported on the portion of the roof which had to be removed. Not only were these two difficulties effectively coped with, but the conveyor was kept running during the whole of the erection of the vertical retort installation, the coal plant of which is arranged to supply coal to the existing horizontal retort installation. A photograph (fig. 2) shows the coal-conveyor still running with the vertical installation erected completely around it.

The third problem was that of the foundations. The subsoil is of a very soft consistency with no real bottom at all. Seventy-seven reinforced concrete piles of the "Simplex" cast-in-place

type were driven to depths varying from 40 to 50 ft. These were connected together by means of a reinforced concrete raft, upon which the retort bench is built. The proximity of the Forth and

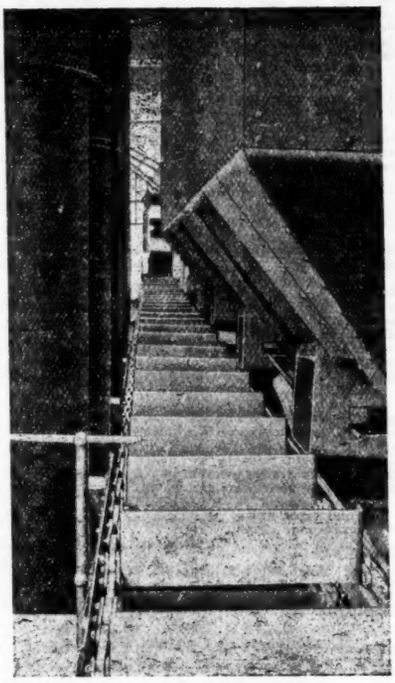


Fig. 2.—Original Push-Plate Conveyor, Working Surrounded by the New Installation.

Clyde Canal rendered it dangerous to excavate the necessary depth to place the coal-breaker underground. The coal-conveyor was therefore specially arranged to pick up unbroken coal direct from the wagons, elevate it to the coal-breaker (erected on a structure above the railway), and then, doubling back, receive it again from the breaker for conveyance to, and distribution in, the coal-bunkers arranged above the retort-bench.

The West gravity-bucket conveyor lent itself admirably to these special requirements, as well as to the further demands for the handling of the coke, which is dealt with by the same conveyor. The coal-wagons are hydraulically tipped, and the contents discharged into the receiving hopper above the conveyor. Thus the whole of the coal to, and the coke from, the retorts is mechanically handled. The coke from the retorts is discharged into wagons, which are tipped into the gravity-bucket conveyor and by it deposited into overhead coke-hoppers, from which it gravitates over screens to the railway wagons. Alternatively, the wagons can be taken up by the lift and tipped into the hoppers for producer feed or run to the existing screens and hoppers at the other end of the retort-house. The machinery is very clearly shown in fig. 1.

Reference has already been made to the problem of utilizing as far as possible the existing structure of the retort-house building; a problem further complicated by the fact that the vertical retort-bench occupies only one-half of the width of the house. The existing roof principals were therefore cut by the oxy-acetylene flame and connected to the structure of the vertical retort-bench; and the gable and one side of the retort-house were extended by means of steel framing, the panels of which were filled in with light brickwork.

The Glover-West system of continuous carbonization in vertical retorts is now too well known to require detailed description. In the Falkirk installation, however, full effect has been given to improvements suggested by the trials of the Gas Investigation Committee carried out on the Glover-West installation at the Uddingston Gas-Works. In the first place, the combustion chambers are arranged to extend the zone of maximum heat, if desired and as required for the maximum results to be obtained from the practice of "steaming" the retorts, down to the base of the retort. The residual heat of the coke is thus entirely used to supply the heat necessary for the water-gas reaction. Further, the setting is arranged with the waste-gas uptake within the combustion chambers and with the secondary air supply so distributed as to produce the equal and maximum heating of the whole of the retorts in the setting. The top three chambers are arranged in series for the circulation of the waste gases before they proceed to the chimneys.

The installation is thus calculated to take full advantage of the modern conditions of gas supply in which, within the limits of the capacity of the distribution system, the maximum number of heat units in the gas evolved per ton of coal is the ruling factor.

The other features of the retort-bench are those common to all installations of Glover-West vertical retorts, and need only be briefly reiterated; the outstanding point being the method of heating the retorts, to which reference has just been made. In the setting, the fuel gas, secondary air, and the products of combustion travel always forward and upward; so that a minimum chimney pull is required, resulting in a long flame in the combustion chambers and conducing to a long and efficient life of the materials exposed to the maximum temperatures.

The elliptical shape of the retort is proved to be correct. It secures rigidity of construction without the necessity of stays to the walls of the setting. The whole surface of the retort is thus presented to the action of the heat, and the retort works without distortion. A separate chimney being provided to each setting, individual control is obtained. Each setting is entirely self-contained, and can be regulated without affecting the conditions in other settings.

The labour in connection with the carbonizing plant is reduced to a minimum. At the top of the retorts the normal work of the attendant consists of opening the coal-valves every two hours to allow the coal to fill the auxiliary feed hoppers from the coal-storage bunkers above, which contain 48 hours' supply. The attendant also periodically inserts a rod into the ball covers to ascertain that the coal is passing freely to the retorts. At the bottom of the retorts he discharges the coke from the coke-chambers every two hours by the simple expedient of opening the doors. The coke extractor, upon the speed of which depends the rate of carbonization, and which is adjusted to suit the temperatures of the setting and the kind of coal being carbonized, is of the helical worm type, which has been so successfully applied to over 4000 retorts in actual operation. The bottom outlet door is hinged to move away from the coke, avoiding any motion relative to it which would give rise to rapid wear. It is packed with readily renewable asbestos, which keeps a tight joint independently of the pressure conditions in the retort, and it is fitted with eccentric fastenings.

Each setting of eight retorts is provided with fuel gas generated in a producer with a grate of the step type, which is readily accessible from the ground level. Clinkering is a thing of the past with this grate; it is merely necessary to keep the fire clean and to remove the ashes at convenient intervals. The adjustment of the settings is facilitated by the provision of dampers to the individual combustion chambers. As, however, the producers are worked on the principle, introduced in the Glover-West system,

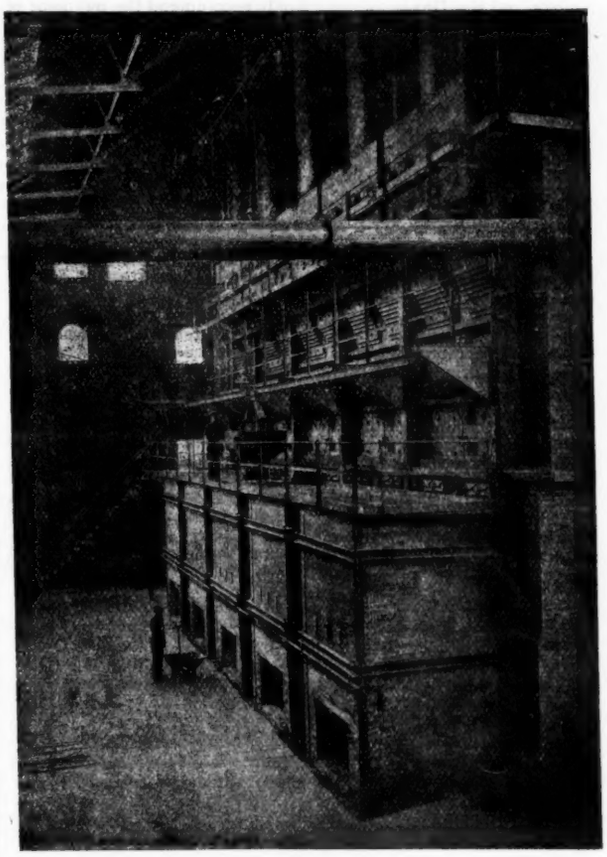


Fig. 3.—Interior View of the Glover-West Retort-Bench.

of the open fire, these only need occasional inspection. The routine adjustment is effected entirely by means of the chimney dampers.

The whole installation is generously provided with platforms and staircases, and a steam-driven lift is provided for dealing with the coke—in the first instance to the producers and retorts, and in the future to hoppers for storage purposes and local trade.

COMMERCIAL GAS COMPANY.

Annual Report and Accounts.

THE following is the report for the year ended Dec. 31 last, which the Directors of the Commercial Gas Company will present at the meeting of shareholders on Thursday, the 23rd inst.

The revenue account shows a profit for the year of £116,985 10s. 11d., which, added to the balance of £26,700 15s. 5d. brought forward from the previous year, amounts to £143,686 6s. 4d. After providing for the payment of dividend for the June half year at the rates of £4 5s. 4d. p.ct. per annum on the 4 p.ct. stock and £3 16s. 8d. p.ct. per annum on the 3½ p.ct. stock, and for the debenture and other interest, there remains a balance of £67,946 11s. 8d. available for dividend in respect of the December half year.

In consequence of the great fall in the selling value of residuals, and the large rise in the cost of coal and other materials, the Directors were compelled to increase the price of gas from 4s. 8d. to 5s. 6d. per 1000 c.ft. as from Lady Day, 1921.

On April 1, 1921, the Company were granted their Order under the Gas Regulation Act, 1920; and the Directors gave notice that as from May 1, 1921, the declared calorific value of the Company's gas would be 475 B.Th.U., and that as from a special reading of the meter indices the price charged for gas would be 1s. 1·8d. per therm.

As a direct result of the coal miners' strike, which necessitated the purchase of large quantities of foreign coal at exorbitant prices, the Directors were again reluctantly compelled to increase the price of gas to 1s. 3d. per therm as from Midsummer, 1921.

The standard price of gas fixed by the Commercial Gas Company (Charges) Order, 1921, is 1s. 3·4d. per therm, at which price the standard dividends of 4 p.ct. and 3½ p.ct. per annum are payable on the two capital stocks. These dividends rise or fall 2s. 8d. p.ct. and 3s. 4d. p.ct. per annum on the respective stocks for each 0·2d. per therm decrease or increase, as the case may be, in the price of gas. At 1s. 3d. per therm, the price charged during the half year to December last, the Company are authorized to pay dividends at the rates of £4 5s. 4d. p.ct. per annum on the 4 p.ct. stock and £3 16s. 8d. p.ct. per annum on the 3½ p.ct. stock; and the Directors accordingly recommend the payment of dividends at these rates, both less income-tax.

Messrs. H. D. Ellis and H. W. Gell, two of the Directors, retire by rotation, and, being eligible, offer themselves for re-election.

Mr. S. W. Savage, one of the Auditors, will go out of office by rotation, and, being eligible, offers himself for re-election.

WILLIAM GRAHAM BRADSHAW, *Chairman.*

Gas-Works, Stepney, Jan. 26, 1922.

The Accounts.

The accounts accompanying the report consist of the usual set of statements. They show that the paid-up stock on Dec. 31 last amounted to £996,405; that £1,076,875 had been added by conversion, making £2,073,280; and that £254,298 remained unissued out of the total authorized capital (including premiums) of £2,340,000. The total amount borrowed at this date was £339,062 10s., and £135,937 10s. was added by conversion, making a total of £475,000, and leaving £114,226 to be borrowed, out of the £585,000 authorized. The capital account receipts amount, with premiums, to £2,606,065. The expenditure stands at £1,511,219, with a nominal amount of £1,212,812 added by conversion—together £2,724,031. There is thus a balance of £117,966 carried to the balance-sheet. A sum of £318 was during the year expended on freehold land, plant, &c.; £31,058 on new and additional buildings and plant; and £1731 on new and additional mains and services. But £20,815 is credited for steamships, stoves, and prepayment meters and fittings. The reserve fund amounted at the close of the year to £49,980, and the insurance fund to £30,542.

The following is the revenue account:

Receipts.

Sale of gas—			
Per meter (number in use, 115,979) at 4s. 8d. and 5s. 6d. per 1000 cubic feet and 1s. 1·8d and 1s. 3d. per therm	£924,461 9 5		
Public lighting and under contracts	27,281 17 8		
		£951,743	7 1
Rental—			
Meters (26,703)	£9,263 15 10		
Stoves (92,071)	34,899 10 5		
Prepayment meters and fittings (88,706)	41,604 3 10		
Maintenance of mantles and fittings	2,610 15 9		
		88,378	5 10
Residual products—			
Coke, less £22,821 12s. 5d. for labour	£222,721 18 6		
Breeze, less £6092 17s. 9d. for labour	9,425 9 8		
Tar	38,977 0 2		
Ammoniacal liquor and sulphate of ammonia	25,609 8 3		
		296,733	16 7
Miscellaneous receipts—			
Rent receivable	£37 15 11		
Transfer fees	64 15 0		
		102	10 11
Total receipts		£1,336,958	0 5

Expenditure.

Manufacture of gas—			
Coal and oil, including dues, carriage, unloading, and trimming	£622,612 9 10		
Salaries of engineer and officers at works	14,734 10 0		
Wages (carbonizing)	60,239 4 10		
Purification, including labour	9,875 12 9		
Repair and maintenance of works and plant, materials and labour (less £972 6s. 11d. received for old materials)	167,554 3 2		
		£875,016	0 7
Profit sharing		4,933	8 2
Distribution of gas—			
Salaries and wages of officers (including rental clerks)	£37,515 16 6		
Repair, maintenance, and renewal of mains and services, material and labour	38,763 15 4		
Repair and renewal of meters	15,828 19 0		
" " " " stoves	41,387 8 5		
" " " " prepayment meters and fittings	66,771 18 6		
Maintenance of mantles and fittings	4,326 14 8		
		204,594	12 5
Public lamps—lighting and repairing		13,569	13 3
Rent, rates, and taxes		40,119	13 2
Management—			
Directors' allowance	£4,750 0 0		
Company's Auditors	150 0 0		
Salaries of Secretary, Accountant, and clerks	5,867 9 6		
Collectors' salaries and commission	6,440 12 0		
Prepayment meter collection	24,971 7 6		
Stationery and printing	4,931 2 0		
General charges	8,175 8 0		
		55,285	19 0
Bad debts		560	19 10
Law and parliamentary charges		2,136	18 9
Superannuations and Allowances, and Workmen's Benefit Society, &c.		19,196	15 4
Official officers, &c.		763	19 2
National Health and Unemployment Insurance		3,702	1 6
Allowances to employees on active service		92	8 4
Total expenditure		£1,219,972	9 6
Balance carried to net revenue account		116,985	10 11
		£1,336,958	0 5

Total wages paid in 1913, £119,010
" " 1921, £367,210
Total salaries paid in 1913, £22,976
" " 1921, £70,591

Statement of Coal and Oil.

—	In Store Dec. 31, 1920.	Received During Year.	Carbonized During Year.	Used and Sold During Year.	In Store Dec. 31, 1921.
Coal—tons	31,826	216,865	216,244	735	31,712
Oil—gallons	370,482	1,056,282	1,085,983	..	340,781

Statement of Residual Products.

Description.	In Store Dec. 31, 1920.	Made During Year.	Used During Year.	Sold During Year.	In Store Dec. 31, 1921.
Coke—tons	6,900	145,965	24,697	124,931	3,237
Breeze—tons	4,200	24,595	..	26,800	1,995
Tar—gallons	568,344	2,126,273	..	2,204,221	490,396
Ammoniacal liquor—butts of 108 gallons	13,905	75,965	80,034	..	9,836
Sulphate of ammonia—tons	230	2,619	..	2,679	170

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold. Public Lights and under Contracts (estimated).	Quantity Sold. Private Lights, per Meter.	Quantity Accounted for.	Number of Public Lights.
Thousands. 1,593,113	Thousands. 26,514	Thousands. 1,455,952	Thousands. 1,506,363	3758
Therms. 11,076,814	Therms. 161,737	Therms. 9,852,028	Therms. 10,179,915	

The last statement is the balance-sheet, which gives the value of the stores in hand at the close of the year, as follows: Coal, oil, &c., £74,610; coke and breeze, £5002; tar, ammoniacal liquor, sulphate of ammonia, &c., £17,067; sundry stores, £65,094—total, £161,774. The figures this time last year were: Coal, oil, &c., £88,290; coke and breeze, £10,732; tar, ammoniacal liquor and products, sulphate of ammonia, &c., £27,002; sundry stores, £69,067—total, £195,091.

Scottish Junior Gas Association (Eastern District).—The second quarterly meeting of the session will be held at Alloa on Saturday next. An inspection of the works will be followed by tea, after which Mr. George Laurie (Assistant at Alloa) will read a paper.

London and Southern District Junior Gas Association.—At a meeting of the Association to be held at the Westminster Technical Institute on Friday evening, the 24th inst., three subjects will be discussed. "Some Notes on Labour Analysis" will be introduced by Mr. A. Broadbent, of the Gas Light and Coke Company; "Town Gas for Bulk Hot-Water Supply, Central Heating, and Steam-Raising Purposes," by Mr. S. B. Chandler, of the South Suburban Gas Company; and "Gas Flues and their Ventilation, with special reference to Cavity Flues," by Mr. W. L. Westbrook, of the North Middlesex Gas Company. The Association's annual dinner has been unavoidably postponed until Saturday, April 1.

GAS-WORKS CHEMISTRY.

At a meeting of the Royal Society of Arts last Wednesday, Mr. E. V. Evans, F.I.C., Chief Chemist of the South Metropolitan Gas Company, delivered a paper on "Some Solved and Unsolved Problems in Gas-Works Chemistry." The chair was occupied by Mr. W. J. U. Woolcock, M.P. (the Association of British Chemical Manufacturers), deputizing for Sir Arthur Duckham, K.C.B., who was unable to attend.

The CHAIRMAN, in explaining that Sir Arthur could not attend, mentioned that by a curious coincidence he had deputized for Sir Arthur on several occasions within the last few weeks. That was mere coincidence, and must not be taken as leading his audience to suppose that he understudied Sir Arthur in any other capacity than as an occasional stop-gap in taking the chair. The reason for Sir Arthur's absence was not of a serious character; but he very much regretted his absence. The Chairman then briefly introduced Mr. Evans.

Mr. EVANS then read his paper, which was supplemented by a number of interesting experiments.

SOME SOLVED AND UNSOLVED PROBLEMS IN GAS-WORKS CHEMISTRY.

Having chosen so comprehensive a title for a short lecture, it will be possible to select only a few of the many problems which present, or have presented, themselves to the gas chemist, and this selection is made almost at random.

NAPHTHALENE.

It is the duty of a gas undertaking to supply to its consumers a gas reasonably constant in composition and uninterruptedly adequate in quantity. In order to carry out this requirement of adequacy of supply, it is necessary from time to time, as the business of the gas undertaking increases, to augment up to a certain point the pressure at which the gas is supplied, or to relay the mains and services which have become incapable of dealing with the increased volume of gas. This is a question for the engineer. Gas engineers have been much harassed in the past by naphthalene, which separates out in a solid form from coal gas and reduces the carrying capacity of the mains and services. This is a question for the chemist, who is hardly justified in studying the more interesting questions of the retort-house or of the efficiency of gas appliances, if the gas manufactured cannot, without interruption, be relied upon to reach the consumer's appliances owing to naphthalene stoppage. The naphthalene problem does not to-day fall under the category of the unsolved.

Before proceeding to describe one method which it is suggested solves the naphthalene problem, it is unfortunately necessary to emphasize the fact that gas technologists have been led astray in the past as a result of relying upon certain naphthalene vapour pressure determinations made by Allen in 1900. From his determinations it would be inferred that wet coal gas at the freezing point of water is saturated by 6 grains of naphthalene per 100 c.ft.; but recent investigation by Dr. J. S. G. Thomas has shown that this is incorrect, and that saturation is attained with only 0·8 grain of naphthalene per 100 c.ft. (fig. 1). The original investigator's curve is correct for temperatures above about 90° F.; but his results are misleading over the temperature interval, which is of the greatest interest to gas engineers. These determinations of vapour pressure refer to the weight of naphthalene that saturates the gas under varying conditions of temperature, and are made by ascertaining the weight of naphthalene existing as vapour when the gas is in contact with an excess of solid naphthalene. It does not follow that the gas is incapable, under certain conditions, of retaining as naphthalene vapour quantities greater than are indicated by the curve. This aspect of the question, which is a highly complex one, has not been studied; the deposition of naphthalene is influenced by the state of motion of the gas, the rate of change of temperature, and probably also by the nature of other hydrocarbons present. Owing to the absence of precise knowledge of the conditions which govern the deposition of naphthalene from coal gas, the question has been referred to as the "Naphthalene Bogey," and would frequently seem to be regarded as phenomenal. Naphthalene deposition is indeed so complex that there exists a school of gas technologists who believe that, to gain perfect immunity from annoyance, all naphthalene should be extracted from the gas before it leaves the works for distribution. By complete extraction of naphthalene is meant that the gas passed through an aqueous solution of picric acid at the rate of 1 c.ft. per hour for twenty-four hours gives no precipitate, or perhaps so little that it is unweighable on an ordinary chemical balance.

Now, ordinary anthracene or heavy oil resulting from the distillation of coal tar is an efficient solvent for naphthalene; but the oil, as ordinarily distilled, itself contains naphthalene, and is thus unsuitable for the complete extraction of this hydrocarbon from gas. If, for example, air be drawn through a sample of anthracene oil, it will be seen that a copious precipitate is obtained by washing that air subsequently with an aqueous solution of picric acid. Bueb, in Germany, used this medium for naphthalene washing in 1902; but the washed gas contained from 3 to 4 grains of naphthalene per 100 c.ft., and reference to the vapour pressure curve will show that this quantity represents the saturation point of wet gas at 13° C. (55° F.). If, however, the oil be steam-distilled before use, and then applied systematically to the gas stream in a compartment washer-scrubber, the complete extraction of naphthalene may be effected. Now, an equal quantity of air to that used in the previous experiment, when drawn through steam-distilled oil, is seen to give no precipitate with aqueous picric acid. This oil is used in a washer-scrubber of ten bays, and flows in counter direction to the gas at the rate of about 15 gallons per million cubic feet of gas. The spent oil flowing from the final bay possesses a concentration of 6 to 8 p.ct. of naphthalene, and the concentration decreases in each bay until in the oil inlet bay it is practically free from naphthalene (fig. 2). The amount of oil used is that required to remove completely the naphthalene from the gas; and the figure quoted above is an average one. The cost of operating the process is shown in fig. 3.

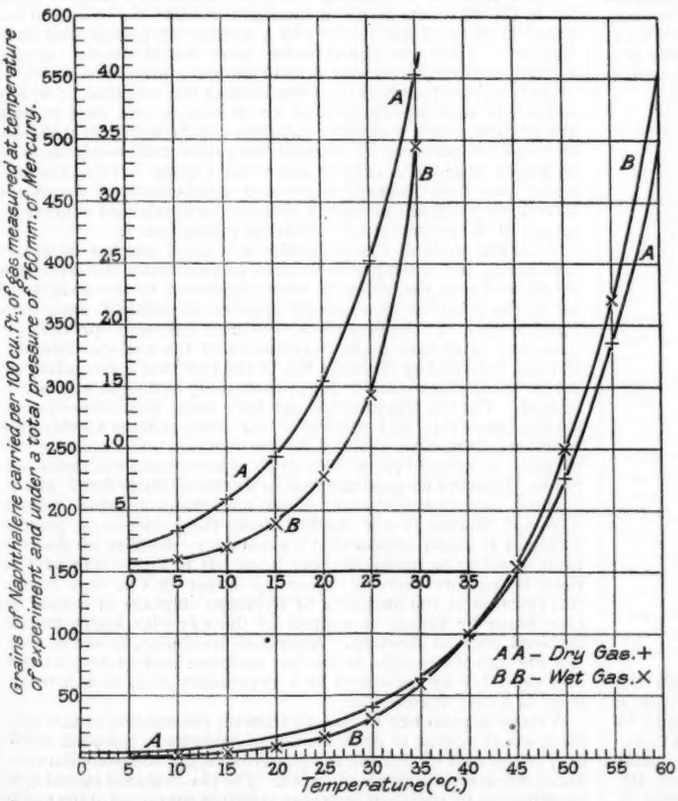

Grains of Naphthalene carried per 100 cu. ft. of gas measured at temperature of experiment and under a total pressure of 760 mm. of Mercury.
Temperature (°C.)
A A – Dry Gas.+
B B – Wet Gas.X

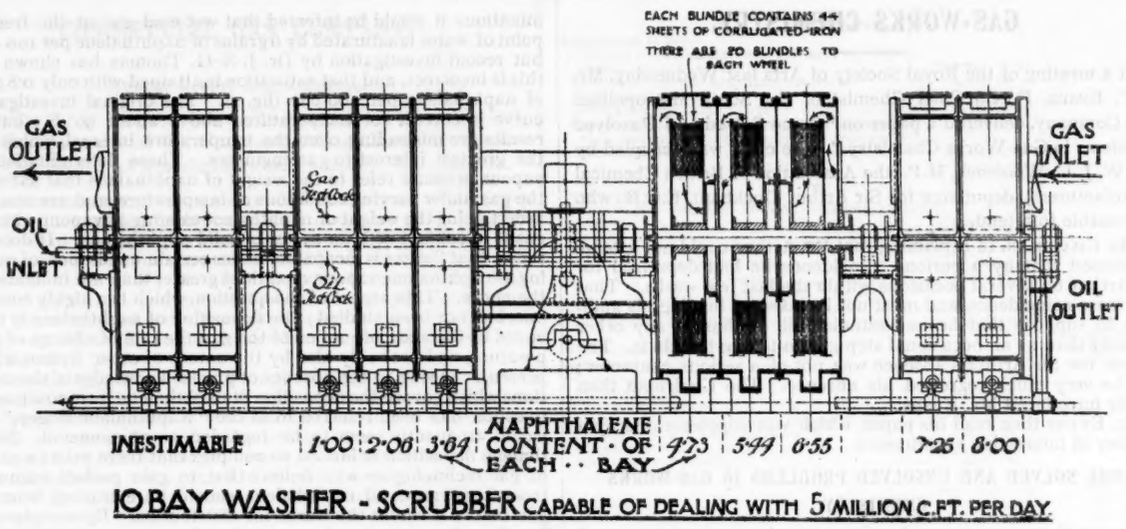
Fig. 1.

This process, in the case of the South Metropolitan Gas Company, extracts about 130 tons of naphthalene annually. The effect upon the business of a gas undertaking is shown by the curve in fig. 4, which represents the decrease in the total annual number of naphthalene complaints received from consumers during the last few years. This diagram is given solely to demonstrate the slope of the curve, which is a *bona fide* one; numerical values are not given. Although the attainment of 1921 is not far from the zero line, it may still be some little while before this ideal, representing complete freedom from naphthalene complaints, is reached, as there must still exist, as a heritage of former years, some naphthalene left in the smaller and less used services.

SULPHUR COMPOUNDS.

It is not proposed to deal at any length with the subject of the removal of sulphur compounds from gas. It is, however, of interest to state that Dr. Carpenter has, within recent times, considerably improved and simplified the nickel catalytic process; and it is to be hoped that he will communicate to the gas industry the nature of this work when it is completed.

Upon the subject of carbon bisulphide, one observation has recently been made which is particularly suitable for lecture demonstration. An inquiry into the causes which determine the fluctuation of the flow of gas and consequent unreliability of certain bye-pass tubes adjacent to the inverted incandescent burner, showed that the gas flowing through the bye-pass tube during the lighting period of the burner is raised to such a temperature that there exists within the tube a miniature sulphur removal process. The conditions are here reproduced whereby it is seen that gas, after passing through a heated bye-pass tube adjacent to an inverted burner, contains hydrogen sulphide, as shown by the brown colouration of lead acetate paper. A control burner carrying an unimpregnated paper shows a negative result. In the heated bye-pass tube, the carbon bisulphide in the gas is undergoing decomposition, with the production of hydrogen sulphide and the



10 BAY WASHER - SCRUBBER CAPABLE OF DEALING WITH 5 MILLION C.FT. PER DAY

Fig. 2.

deposition of carbon; and this deposited carbon, together with the metallic sulphide produced, is one of the factors contributing to the inefficiency of this form of bye-pass. The difficulty may be overcome by designing the burner and bye-pass in such a way that the latter does not become heated, or by making that portion of the tube liable to be heated of pipeclay or other suitable insulating material.

HYDROGEN SULPHIDE.

The method of removing hydrogen sulphide from coal gas by means of oxide of iron, though almost universally practised to-day by gas undertakings, is an ancient process. The chemist has been

Working Costs of Naphthalene Extraction.

Item.	Per 10 Therms. d.
Oil used	·189
Wages	·019
Power	·035
Repairs and maintenance, and sundries	·008
	·251
Interest on capital	·051
Establishment charges	·022
	·324

Fig. 3.

unable to recommend an alternative so trustworthy and economical as to render the present process obsolete. In the ideal process the value of the recovered sulphur or sulphuric acid should be at least equal to, if not greater than, the cost of operating the process. It is one thing to create an ideal and another to accom-

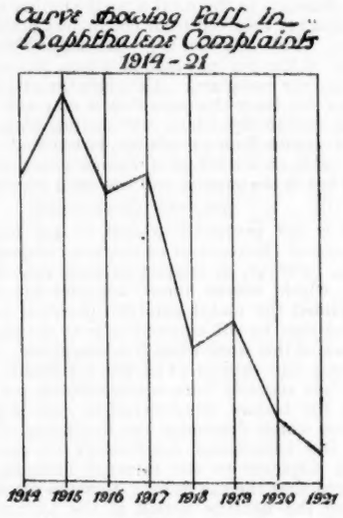


Fig. 4.

plish it, and it is believed that this problem still falls under the category of the unsolved. The present method is not only a financial burden to the gas undertakings, but it is also open to criticism in other respects. The physics of the process is unsound, in that a gaseous impurity at an initial concentration of 1 p.ct. by volume is extracted by a solid reagent. Again, the expenditure involved in handling large masses of solid oxide of iron in times of high labour costs accentuates the advantages that must accrue by discovering a simple process based on the use of a liquid reagent. Further, the presence of small quantities of hydrogen cyanide in the gas results in the formation of ferrocyanides, which render a proportion of the iron inactive during each cycle and lead to the oxide becoming prematurely inactive. Finally, the efficiency of the oxide depends to a large extent on its physical nature, and its selection is a matter of considerable importance.

To avoid excessive labour costs due to the handling of large masses of solid material, and to allow of the selection of a rapid, yet simple reaction, uninfluenced by other constituents of the gas, the tendency in recent years has been to develop a wet method of purification, in which solutions or suspensions may be dealt with by pumping machinery. The fundamental reaction upon which by far the majority of the purification processes invented are based is that of the oxidation of hydrogen sulphide to water and sulphur.

$$2H_2S + O_2 = 2H_2O + 2S.$$

This is indeed the resultant reaction of the iron oxide process, the hydrated ferric oxide merely acting as an intermediary which reacts with the hydrogen sulphide in the gas and is regenerated by contact with air, either *in situ* or externally.

In viewing the reaction from this aspect, and knowing also the ease with which hydrogen sulphide combines with oxygen, it is natural that the first attempt to discover a simple process would lie in the direction of endeavouring to oxidize the hydrogen sulphide in the coal-gas mixture by a process of preferential combustion. Thus the experimental work would consist in conducting coal gas, first, over certain oxidizing materials, which at slightly elevated temperatures would effect this reaction, or adding to the gas such a proportion of air or oxygen and then passing the mixture over a contact or catalytic substance, again at slightly elevated temperature, to promote the preferential combustion of hydrogen sulphide to sulphur and water vapour. If this reaction could have been induced to proceed satisfactorily, it would not have been a difficult matter to remove the condensed sulphur by means of either filtration or electrical precipitation.

A careful study of the properties of a large number of oxides was made, but attempts to oxidize preferentially the hydrogen sulphide of coal gas, either by heated oxides or by the addition of air in the presence of a contact material or catalyst, have been unsuccessful. In the first place, it is most difficult to prevent the oxidation of certain other constituents of the coal-gas mixture; but the outstanding difficulty lies in the fact that a secondary reaction takes place when coal gas containing hydrogen sulphide is heated. Carbon oxysulphide resulting from the interaction of carbon monoxide and sulphur is the main product of this side reaction. It escapes easily from the reaction zone, and is a sulphurous compound more difficult to remove than hydrogen sulphide. It serves no good purpose to describe in any detail partly-finished experimental work which has given negative results. Although finality is not reached, from the evidence at present acquired it would appear that a satisfactory solution of the problem is not to be found on these lines. It is interesting to note that, in patents recently taken by Bayer & Co. and others, this reaction of the oxidation of hydrogen sulphide is caused to take place by means of contact of the gas with highly-porous material, such as charcoal. After such treatment, however, very few illuminants remain in the gas mixture; and, although these may probably be recovered at a reasonable cost, such a treatment is a very drastic one.

A more hopeful line of investigation for the solution of this problem would appear to lie in the use of oxidants in the cold, as not only is the cost of heating the gas avoided but the secondary reaction referred to above is obviated. The ideal oxidant should give on reduction by means of hydrogen sulphide contained in the gas, a soluble product capable of easy regeneration to the original com-

pound by the passage of air through the solution. The sulphur would then be the only material remaining out of solution and could be filtered off in a practically pure state. A fairly complete study has recently been made of inorganic and organic oxidants. It is only possible at this stage to demonstrate a typical organic reaction which has recently been protected by patent. It is well known that certain dyestuffs are readily reduced to colourless or faintly coloured products known generally as leuco-compounds which, in turn, are easily reoxidized to the parent dyestuff. Indigo, for example, is insoluble but gives a soluble reduction product (indigo white). The dye is fixed upon the fibre by immersion of the fabric in the soluble leuco-compound; and then, by subsequent exposure of the fabric to air, the fast colour is produced.

It was found that hydrogen sulphide of gas is capable of effecting the reduction of certain dyestuffs which, in turn, reoxidize to the original dyestuff by the passage of a current of air. The sulphur naturally remained out of solution. Investigations were made to discover those dyes which are both soluble themselves and have soluble leuco-compounds so as to obtain the ideal type of oxidant. (Soluble dyes forming insoluble leuco-compounds can be used, but their reduction products require a large and unreasonable excess of air for their oxidation.) Unfortunately, few dyes of the required type could be found.

The reduction of such dyes by hydrogen sulphide in neutral solution proceeds, if at all, only very slowly, and, consequently, an accelerator has to be used in the form of some basic substance. Alkali carbonates and bicarbonates are very effective for this purpose, but unfortunately, so much sulphur is lost, owing to the formation of salts of polythionic acids, that the use of such compounds is prohibitive. Turning to the organic bases as accelerators, pyridine and allied compounds are found to give the best results, since other types frequently undergo gradual oxidation during the aeration process with consequent conversion to inactive substances. Pyridine is especially suitable, since pyridine-water mixtures act as solvents for certain leuco-compounds otherwise insoluble in water—*e.g.*, leuco-methylene blue. The use of this solvent allows, therefore, a wider choice of dyestuffs. With such an organic base as promoter, no loss of sulphur occurs; but unfortunately pyridine, owing to its high volatility, cannot be used in the gas stream without also installing a recovery plant. Higher boiling basic coal-tar fractions of the quinoline series may also be used; but these necessary refinements materially alter the simplicity and financial aspect of the process, and up to the present, interesting though the chemical aspect of these reactions may be, it has not been possible to recommend the abolition of oxide purification. Other processes that have from time to time been proposed for the displacement of oxide of iron do not present the simplicity of such oxidation reactions as those indicated above; and it is to be hoped that before long it will be possible to report success along these lines—effected either by inorganic or organic reagents. The indications of to-day are not unfavourable.

Tobacco Smoke.

Following a dissertation upon vat dyestuffs, it is thought that a diversion on tobacco smoke will be welcome. The aim and object of this diversion is to discuss the question of risks. Statistics will show that by travelling to the Adelphi to-night each of us has incurred risk of death, that each day we risk death or accident by transit, ptomaines, food preservatives, disease, and many other unwholesome things, including even a possible death from coal gas by carbon monoxide poisoning. To be alive is indeed to be subjected to a series of risks; but it is necessary, above all things, to maintain a due sense of proportion of such risks, and statistics will show that death by accidental gas poisoning constitutes an almost negligible risk to the community.

Now the chemist is unfortunately able to detect dangers that others fail to see. About 90 p.ct. of our manhood smoke; and I propose to show you what risks are involved in this pleasant operation of smoking. (Lecturer here lighted and smoked a cigarette.) Its risks are really negligible; the process of smoking having proceeded without any apparent harm since the days of Raleigh. Notwithstanding this, the chemist can scare the public, if he so wishes, on this question of smoking and upon many others. Parliament has decreed that coal gas shall be free from hydrogen sulphide, and has instituted a severe test in which the gas is passed over papers previously immersed in lead acetate solution. It will be seen that the lead paper in the cigarette holder has already turned brown, showing the presence of hydrogen sulphide; while the second control paper, not previously immersed in lead acetate solution, shows no colouration. (It may have been thought that the colouration was due to tarry matter deposited from the smoke.) Now, the quantity of hydrogen sulphide is exceedingly small, and the risk is probably negligible; yet the chemist has to remember that hydrogen sulphide, which is undoubtedly drawn into the mouth when smoking, is appreciably more toxic than carbon monoxide, and, in addition to this, is a cumulative poison. This, however, is not the sole toxic constituent of tobacco smoke. It may be demonstrated that carbon monoxide and hydrogen cyanide (prussic acid) are also present. There is here a small apparatus for producing tobacco smoke. The process of smoking is partly one of combustion, partly carbonization; and the plant resembles a miniature gas-works.

A retort-house of cigarettes leads to a condenser packed with glass wool for the purpose of arresting suspended tarry matter; the gases are then washed by an alkaline solution for the purpose of removing hydrogen sulphide and hydrogen cyanide, then by an acidified solution for the purpose of removing alkaline constituents of the smoke. The gases are next measured and are collected in the sample holder. The exhauster is the gasholder, which has to be operated intermittently following the method of cigarette smoking. It is in this apparatus that some of the determinations have been made which allow of subsequent statements. The time taken in working the apparatus is too long for a lecture demonstration, but in order to prove the presence of the toxic substances in tobacco smoke, a Havana cigar is now being smoked through a purifying apparatus, which consists, first, of a wash-bottle of caustic potash, for the purpose of arresting the hydrogen sulphide and hydrogen cyanide, secondly, of a loosely-packed tower of soda-lime, and, finally, through a solution of bullock's blood. It is shown, even after a short period of smoking the cigar, that both hydrogen sulphide and hydrogen cyanide are present in the caustic potash, while the characteristic change of colour in the blood solution is indicative of the presence of carbon monoxide. Tobacco smoke contains quite appreciable quantities of the toxic gas carbon monoxide. It has been found, for example, that the smoke from a cigarette contains up to 1½ p.ct., while that from a cigar smoked irregularly contains up to 7 p.ct. Assuming that carbon monoxide is not absorbed by the membranous coating of the mouth, it may be shown that with four people smoking cigars in one room the carbon monoxide contained in the air is liable to be equivalent to an escape of gas which would certainly be obvious to the olfactory organ.

During last year a Committee appointed by the Board of Trade, under the chairmanship of Sir William Pearce, reached the important conclusion that no limit should be placed upon the percentage of carbon monoxide to be contained in the gas distributed to the public. This Committee was fully alive to the toxicity of carbon monoxide and to the responsibility it may be called upon to take by arriving at this decision; but it is suggested to you that, to be read into its decision, is its belief that the gas industry is now equipped with men of science at the University of Leeds, South Kensington, and other centres, and the safety of the public can be entrusted to the gas undertakings. The chemist will play an important *rôle* in deciding upon any change that, for economic reasons, may warrant an alteration in the constitution of the gas supplied. The Institution of Gas Engineers has shown itself to be fully capable of conducting, with the aid of the University of Leeds, careful and comprehensive investigations into matters affecting the fundamental principles of gas manufacture, and the public may rely upon such a body continuing to protect their interests on the question of carbon monoxide.

Reverting again to these demonstrations upon smoking, I should like to add that, personally, although an ardent smoker, I think the habit is a dangerous one, and causes more harm than does coal gas. Notwithstanding the risks to which one is subjected when smoking, I do not propose to discontinue it—preferring the risks. Neither is it my object to start a Press campaign to depopularize smoking. The example is chosen solely to demonstrate how simple it is for the chemist to elaborate upon the question of the unknown risks of life. While we must not shut our eyes to the engineering and chemical disabilities which may arise from unduly increasing the carbon monoxide content of gas, yet I should like to take this opportunity of urging the Press and the public to retain a sane and balanced conception on the question of risk.

Smokeless Fuel.

For many years the German dye industry has adopted the practice of manufacturing a colour of high purity—in some cases reaching 100 p.ct. chemical purity—and before sale has slightly diluted the product with a harmless material. This practice is not resorted to for the purpose of defrauding the customer; but it allows a manufacturer to become assured that each delivery from the works shall be consistent as regards the quantity of colour contained in it. The dyer knows, and implicitly relies upon the fact, that each unit weight of material taken by him will have the same dyeing effect. If there is one thing above all others that the chemist attached to the chemical industry soon learns to appreciate, it is the necessity of maintaining the output of a consistent product. The tar distiller supplying anthracene, naphthalene carbolic acid, &c., for the chemical market has to work to a well-defined specification. Naphthalene, for example, to realize full market price, must have a setting point of 79·5° to 79·6° C., and must, above all, have the appearance of the material here shown. If imperfectly purified before final distillation, it may destroy a batch of dye intermediates, and in this event, the tar distiller can but expect his material to fall into disrepute. The raw material of the tar distiller is highly heterogeneous, and to obtain from it products of consistent quality there must exist an outlet for the impurities. There are, indeed, certain fractions of coal tar marketed whose specifications are not so rigid as to prevent the admixture, within limits, of other tar products resulting from processes of purification. The tar distiller, however, uses whenever possible the less marketable materials as fuel under the stills or boilers.

The sales department of a chemical undertaking continues to urge its technical colleagues to produce—if possible without additional cost—an article, be it creosote, pitch, anthracene, sulphate of ammonia, &c., which shall, in competition with other similar products, establish its supremacy on the market by supe-

riority in the particular quality for which it is required. Now it is useless to have attained superiority unless consistency of output may be maintained. A not unimportant duty of the chemist in the gas industry is to aid the gas engineer to produce from a heterogeneous material coal, products—be they gas, coke, tar, or ammoniacal liquor—of consistent quality. It is essential that the gas engineer give first attention to the main product, coal gas, and in this respect the author regrets that one of the clauses of the parliamentary Bills which the gas industry joined in framing —namely, that relating to the limit imposed upon the variation of calorific value did not refer to variations above, as well as below, the declared calorific value—was not contained in the final Acts.

The next most important product of the gas-works from the point of view of revenue, is coke; and it is to this product that chemists must turn their attention. Its purity must of necessity be dependent upon that of the original coal. In addition to this adequate care is not always given to the cooling process. The method of dry cooling with the exclusion of air, as practised by several gas-works, is ideal; and it is hoped that such a method may be found capable of general application. Notwithstanding this, the coke of to-day is a high-class industrial fuel and will demand even a more ready market than at present, and probably a greater revenue to the gas undertakings in the future, if its manufacture is perfected. More attention should be given to the advisability of selecting, screening, or washing the coal prior to its carbonization for the purpose of reducing the ash and sulphur of the resulting coke. This is no reason why, for industrial purposes, coke should not in the future entirely replace raw coal, and it is believed that the cost of reducing the ash content of coal prior to its carbonization would be repaid by the saving of labour costs for clinkering and the greater efficiency that may be obtained by the use in industry of coke so made. The opportunity may however be taken of describing to you a process recently worked out by E. R. Sutcliffe and Edgar C. Evans, whereby gas coal may yield a coke which is very suitable as an industrial fuel, in that the ash from it falls away as a fine powder completely free from combustible matter. [A sample of this ash, which is of a silky nature, was shown.] In this process, coal, admixed with a small quantity of breeze to prevent expansion during carbonization, is ground to a fine state of division. It is then washed by a flotation process, dried, and briquetted, and subsequently carbonized. In the first place, the briquettes are very dense; and this, coupled with the reduction of ash, allows a greater throughput and larger output of gas and bye-products from existing plant. The coke retains approximately the form of the original briquette. [A specimen was shown.] It is not friable, and is conveniently transported. Many claims are put forward by the inventors regarding the increased yields of distillation products from the process, but it has not yet been sufficiently examined by the author to allow of a critical discussion.

It is perhaps more particularly the problem of coke as a domestic solid fuel that should receive our attention. In the first place, it is assumed that, however efficient the gas-fire and gas-heating appliances in the future may be, there will remain a wide market for a good solid fuel. Even if there is a doubt by gas technologists upon the question, there must be unanimity in the belief that raw coal should not be burned for industrial or for domestic use. Above all, coal, which is the basic raw material representing this country's main wealth, should not be exported in its raw state but should be first treated, preferably at our gas manufacturing centres, for the manufacture of gas, motor fuels, and raw materials for the chemical industry. It is not proposed to advocate to you the practice of low-temperature carbonization. Not only is the financial balance-sheet of low-temperature carbonization less satisfactory than that of the manufacture of straight coal gas as practised to-day, but the great increase in the quantity of coal which would have to be carbonized, the difference in the nature of the products—particularly of the gas and the tar—the simultaneous creation of a market for the solid fuel, in addition to the disabilities surrounding the balance-sheet, are all factors which cause the gas engineer to appear lethargic in this matter.

It is not difficult to analyze the attitude of mind of the organic chemist on this question, but it is one thing to appreciate the attitude of mind and another to revolutionize a stable industry when the financial advantages are certainly not apparent. This attitude of mind may be best explained by stating that the gas industry is one with which the organic chemist cannot be expected to be in immediate sympathy, as its basic process is one of destructive distillation. The industry is indeed a poor starting ground for the organic chemist who, after long training, during which he learns to handle and conserve organic molecules during a reaction in the laboratory (which means obtaining a high yield of the required product), is naturally shocked at the ruthless destruction of the coal constituents during high-temperature carbonization. It does not, however, take long for this discouragement to disappear, for he is rapidly made aware of the fact that high-temperature gas production is really a financially sound proposition.

The carbonization of coal at low temperature is not in itself unsound, and it will probably be practised more largely in the future. Aiming at treating raw coal prior to its use, it constitutes a decided step towards the abatement of smoke, and also obviates waste of the valuable constituents of coal at home, and results in conservation of such constituents in this country, if the solid fuel from the process is that eventually to be exported. Solely from the point of view of smoke abatement, any solid fuel which may be burned with the ease of coal, and with as little trouble, will have a very ready market.

Now, the bye-product coke-oven industry has sprung up in this country and it is a question whether at least the major operations of this industry should not have been situated at gas-works, for it is proven that the gas manufactured is quite suitable for a town's supply of gas. It should be at least admitted that the gas industry might have taken a more integral part in the building of this coke-oven industry. The question now arises: Are we about to permit a domestic fuel industry to be created and constitute itself as another coal-distilling undertaking, marketing in competition to the gas industry solid fuel which will not only affect the use of coke for domestic purposes, but may even influence the output of gas for heating purposes? This is the problem that the gas-works chemist will be expected to solve, and it is probable that he has already proceeded a long way in the direction of its solution. In an adjacent room there burns a fire of smokeless fuel which has been made with gas coke as the basis. Briquetting has not been used, neither is pitch the binding material, for the latter is not suitable for the manufacture of a smokeless fuel. The binding material is produced by the admixture of a proportion of cheap coal. The whole is heated to the temperature of

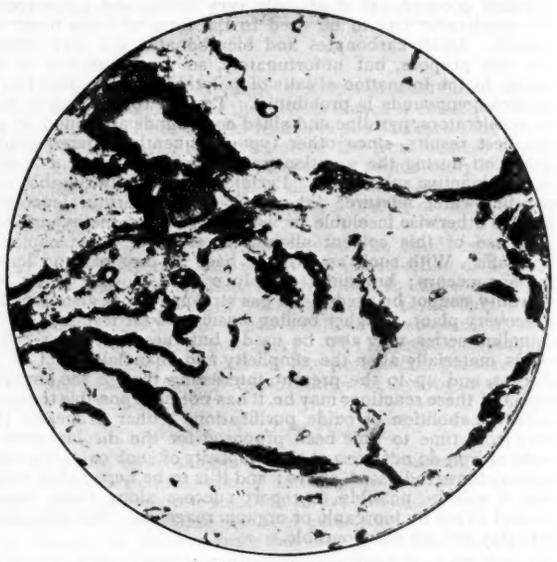


Fig. 5.—Lung Section of a Town-Dweller (Enlarged 28 Diameters).

the waste gases in the retort-house. The process is a rapid one as there is not much volatile matter to be driven away; but that which *is* driven away is recovered, and has a definite market value. The volatile content of the resulting fuel is from 6 to 8 p.ct. [A sample of the fuel was shown.] It is not friable and is readily transportable. It ignites as readily as coal, and it is thought that it would be a material superior to coal, were it not for the original ash in the coal and coke from which it is manufactured. On account of this, domestic fires from this smokeless fuel are dirtier as regards ash than similar fires burning good household coal. When this question of ash is overcome either by selection, screening, or washing, it is then I think that we can be assured of possessing a material that will even be preferred to coal, and gas undertakings will have made a further, and perhaps a final contribution to the smoke abatement difficulty. The material burns to the silky-like ash described previously.

Miner. Town-Dweller. Shepherd.

Fig. 6.—Lung Sections.

Much has already been written and said upon the advantages to be reaped by the abatement of smoke, and it will be readily understood that gas undertakings will be among the first to find immense advantage by the absence of solid particles in the air.

The heritage that we possess in the gas industry by virtue not only of the efficiency of the gas-making process, but also of the efficiency and economy of gas appliances, is one that is generally appreciated. The advantages of gas for heating and for power purposes are admitted by all who have adopted it. It is, however, in the production of light by the incandescent mantle that we are particularly fortunate. There exists, in my opinion, no other means of artificial light which produces on the one hand, a soft light which is particularly suitable for avoidance of eye-strain, and, on the other, a healthy circulation of air within the building or living room, and moreover, a degree of warmth which is an asset in all cases in eight months out of the twelve of each year, but constitutes a very real comfort in winter. Gas lighting is generally credited with the objection that our ceilings become blackened by it and more frequently require whitewashing. This is due to the fact that air, laden with solids, is driven at a high velocity in an upward direction by the ventilating effect of the burner, and then, by the sudden reduction of this speed by contact with the ceiling, a portion of the solid material is precipitated upon the ceiling. It is still believed by some that unburnt particles of carbon from the gas exist among the *mélange;* this is untrue. With other forms of lighting there is no less solid matter in the air, but without this ventilating effect such solid matter may find its way to the lungs of the occupant of the room. [Slides (figs. 5 and 6), which had been kindly loaned for the lecture by Dr. C. W. Saleeby, were shown. These demonstrated the lung of a town dweller in contrast to that of a countryman.]

It is a simple matter, and costs little, to cause our ceilings to be whitewashed, but it is a task beyond even the manipulation of the surgeon of to-day to whitewash our lungs. There is a natural tendency in the human being to be more conscious of the hole in the back of the sock above the shoe line than of the one in the toe; and it must be admitted that, unlike the ceilings, our lungs are not open to the inspection of our friends and critics. There will come a time when it is considered as important to have a clean set of lungs as it is to-day to possess a set of sound and clean teeth. The gas engineer must realize that, with a smokeless atmosphere, gas lighting, secure though it is to-day, will have its one supposed disability removed.

In conclusion, my thanks are tendered to Dr. Charles Carpenter, whose ideas form the basis of our experimental work, and whose guidance is essential to any success that may have been attained. I should also like to take the opportunity of acknowledging my indebtedness to my assistants (Messrs. H. Hollings, M.Sc., H. Pickard, B.Sc., and H. Stanier, B.A.) and to the demonstrator of this evening, Mr. C. E. Carey, B.Sc.

As mentioned above, many experiments were carried out during the course of the lecture. To illustrate the reduction of certain dyestuffs into faintly coloured products known generally as leuco-compounds, the author had a vessel containing an indigo derivative. This was reduced to a leuco-compound by the addition of hydrogen sulphide, and a piece of paper was dipped into the leuco-compound. On exposure to the air, the paper turned blue. Subsequently, the indigo derivative was regenerated by the addition of oxygen.

In the course of experiments showing the presence of hydrogen sulphide in cigarette smoke, Mr. Evans smoked a cigarette in a holder which contained two pieces of paper, one soaked in lead acetate solution, while the other was not. There was also cotton wool in the holder to arrest the tarry matter. The papers were subsequently exhibited, and the one soaked in lead acetate was discoloured, showing the presence of hydrogen sulphide, while the other was not. Also, it was seen by another experiment that the passing of cigar smoke through a sample of blood causes a red colouration. In demonstrating this colouration, Mr. Evans used gas lighting, and remarked (amid laughter) "Let us have a proper light," at the same time extinguishing the electric light in the room. He explained, however, that he was using special mantles, which had been recently designed to give a daylight spectrum. The colouration of the blood was due to carbon monoxide passing through it.

DISCUSSION.

Dr. J. S. HALDANE, F.R.S., opening the discussion, expressed his delight in listening to the lecture, and congratulated the Royal Society of Arts on having secured the services of Mr. Evans. Although it was not his duty to propose a vote of thanks to the lecturer, he would do so gladly. There were a great many controversial points in the lecture. Mr. Evans had painted a rather gruesome picture of the effect of coal upon the lungs, and had demonstrated his remarks by showing slides of the lungs of a coal miner, a town dweller, and a shepherd. He (Dr. Haldane) wanted to present the other side of the picture. He was very familiar with the subject, having had to deal with it for a very long time. Those in this country who breathed most coal dust were the coal miners; and, after looking at the statistics of deaths of coal miners from lung disease—particularly consumption—it would be found that they were extraordinarily healthy. The death rate from consumption among coal miners, which was usually attributed to dust, was rather lower than among farm workers in this country. This did not bear out the bad reputation which the inhalation of smoke particles had in the popular esteem. He was not arguing that we should live in a horribly smoky atmosphere. He was all for having the air of London cleared of smoke, because it made everything so dirty, it made it more expensive to live in London, and it obstructed the light. In that way it was bad; but he was very doubtful as to what the effect of breathing small particles of smoke was. Speaking for a moment as a physiologist, he said it was true that large quantities of small particles went down into the lungs. There those small particles were taken-up by microscopic cells, the duty of which was to clean up the dust; and under the microscope these cells could be seen crammed full of dust particles. Then they wandered up the air passages, and came out of the body. The cells were constantly at their work of cleaning, and if one lived in a dusty atmosphere one had a very efficient cleaning service on the part of those cells. The coal miner, when he was at work in the mine, always had what was known as black sputum, and that lasted for quite a good while after he had stopped work. This was evidence that the cells in his lungs were doing their work well. These same cells also had the duty of cleaning-up the micro-organisms in the lungs—such as the tubercle bacilli, &c. Perhaps this was the reason why coal miners were so extraordinarily free from consumption. He thought the author himself had been rather taken in by a bogey over this dust question. On the other hand, there were some kinds of dust which were deadly, and pure quartz dust was one of them. For some reason the cells were not accustomed to those, and a gold miner in the Transvaal would get phthisis in the end.

Prof. C. V. BOYS, F.R.S., remarked that he would like to add to what Dr. Haldane had said as to the pleasure the lecture had given to those present. Dealing with smokeless fuel, he stated he had had a good deal to do with Minerals Separation, Ltd., who were separating by a physical process the fine particles of mineral from other fine particles. It was not a washing process, but a surface-tension process. Among other things, they had been using the process for removing the ash from powdered coal. It was not possible to remove the whole of the ash; but if they took a piece of coal and ground it up finely, the part of the ash which was in the coal in the form of separate particles came out in the powder as particles of ash, whereas alongside there were particles of coal. On the other hand, the particles of coal might themselves contain a residue of ash, which could not be dealt with. The ash which existed as separate particles was now being extracted from the coal on a large scale by these same surface-tension processes that were being applied to the separation of (say) the minerals of Broken Hill from the sulphide ores. The coal waste and rubbish at the head of every coal mine could be treated, if there was enough coal in it—not otherwise. If there were enough particles of coal in all that rubbish and dirt, it could be economically separated-out by the froth flotation process, and could be made into briquettes and utilized. This was a matter which, to his mind, was of great national importance in connection with the controversy which the lecturer had not touched upon—namely, the use of shovels and forks in mines. Every bit of dirt, however fine, that was in a mine which contained coal, belonged to the country, and had no business to be left behind. It was a wicked thing that it should be lost in the depths of the mines; it could all be quickly and economically treated, and made into good coal. It so happened that only on the previous Sunday he was burning some briquettes made from this coal, to see how they burned, and they burned quite nicely. With regard to smokeless fuel, some months ago he had sent a short communication to the "GAS JOURNAL," as they were treating the use of common gas coke as a domestic fuel as a difficult problem, and as a problem waiting to be solved. His object in writing was to say that there was no problem. He had been burning coke in his house—he would not allow coal at all for heating his living rooms—and he had been burning that coke in the easiest of all possible ways, and with no special appliances. If there were any secret in the burning of coke for a domestic fire, it was "have no iron." Iron was poison to a coke fire. Also, have no draught, which was contrary to all that anybody had ever said. The violent draught necessary for a small coke fire burning in an iron surround was not really wanted. Put the coke on a brick ground, with a firebrick back, and let no air get to it, except what came in from the front and went out at the top. The only heat that escaped was from the surface at the front and at the top. If a small fire were wanted, make a little fire. With a small draught the coke would keep alight for quite a long time. When the weather became colder, build a bigger fire. The coal from which his coke was made contained a lot of ash, and it would light with no trouble. The coke fire was red hot, and gave a proper heat long before a coal fire, because there was no distillation to be gone through first. All that had to be done with a coke fire was to put a poker under it, and lift it up two or three times a day, so that the ash would drop through to the bottom. When the fire was going well, the dust was carefully put on the top with a shovel, where it remained and burned, so that there was no waste. In conclusion, he supposed the only reason he was still alive was that he had never smoked. [Laughter.]

Dr. CHARLES CARPENTER, after paying a tribute to Mr. Evans for his very admirable lecture, drew attention to his remarks as to the advantages of gas lighting. There was a new school to-day which seemed to imagine that gas lighting was a thing of the past. His own impression was that this had arisen from the fact that some people had considered it fashionable—and, indeed, part of the obligation they owed to the public in general—that they should have their houses lighted by electricity. He assured them at once that this was the greatest possible mistake. He agreed that during the war there were certainly irregularities with regard to the composition of gas, which made its use, not only for lighting purposes, but for heating, not altogether free from inconvenience. This was a state of affairs, however, for which there was no justification to-day. There was no reason whatever why gas should not be used for lighting with the same certainty of obtaining good results, the same simplicity, the same absence of care and attention, as obtained with electricity. But it was essential that attention should be paid to another important matter to which Mr. Evans had referred. He was not sure whether the meeting thoroughly understood the point the lecturer had made with regard to the manufacture of dyes. The point was this—it was most essential that if a definite quantity of the dye was taken, it should in all circumstances give a definite result. If a normal (say, a 99 or even 100 p.ct.) product were distributed, there might be occasions when the quality would fall slightly below, and the result would be extremely detrimental to the dyers' work. But by the system to which the author had referred—of lowering, as it were, the product to a definite percentage whatever that might be—it was possible, if carried out on a large scale, to get absolutely definite results from the product which the dye producer put on the market. This frame of mind—the appreciation of the necessity of supplying a gas of constant quality—was exactly the one which should

be encouraged by the gas engineer; and it was one direction in which the chemist could be of enormous use in improving gas operations. He believed that in the past the gas engineer had thought far too much of volume. Thanks to the proposal of Sir George Beilby, of the Fuel Research Board, that was a thing of the past, and instead of talking of cubic feet, we spoke to-day of therms. Might be, in passing, suggest that the new school should train themselves in that expression, and think in therms, so that if they were asked questions by some old fossils, who still existed and still referred to volume, in some of the lectures that from time to time took place, they would impress upon them the importance of speaking in the language of exactness, and not in the language of inexactness.

Prof. H. E. ARMSTRONG, F.R.S., said he had been waiting for that evening for a very long time. Mr. Evans had called himself a gas chemist. He himself objected to any qualification of the term "chemist." A man was a chemist, or he was not. It was obvious that Mr. Evans was not a chemist; he was an artist and a poet. He had treated his audience to a variety entertainment, and a variety entertainment of a character that it would have been inconceivable ten years ago to put before a set of gas men. Excepting Mr. Evans, and perhaps one or two more, there was not then a chemist attached to a gas company. He himself had been telling them that for years and years; and it was only when the war broke out that they made the discovery that they were no use without the chemist. They were beginning to see now what the result was of attaching chemistry to industry. He would like to pay a tribute to the extraordinary service which Dr. Carpenter had rendered to the gas industry. [Applause.] He was the man who had tried to put the industry on a scientific basis, standardize gas, and make it honest goods. The very great danger we were in was that his example might not permeate through the mass. Mr. Evans had not attempted to paint the town red that evening, but to stain gas blue. Perhaps blue was a little symbolic of the condition of the gas industry. They spoke of blue water gas; and he was inclined to think they were in a state of blue funk with regard to their future, because that future was a very serious one. They had had carbonic oxide referred to; and it was desirable, in the public interest, perhaps, to say a word or two more about it. They owed a great debt of gratitude to Dr. Bone for having raised it. In the first place, he had done, in the course of a very short time, what chemists had striven unsuccessfully to do—*i.e.*, to teach the public that there were two oxides of carbon, to distinguish between them, to know their names, and to realize that one was combustible and the other incombustible. There had been a good deal said about its being poisonous. It was poisonous, of course, but only to those who wanted to put their heads into the gas-stoves and make use of it for suicidal purposes; and there was not the least doubt that Dr. Bone had done a great deal towards creating a fashion. Prof. Boys and those who were non-smokers would be a little encouraged by what the lecturer had said. It had been his privilege to be invited to go down to the Company's laboratory and see the smoking experiments. Being a non-smoker, he understood all about it, and he was surprised at the results, which were very startling. They had found, taking an ordinary cigar—he should say it was a bad cigar by the brand—that only about one-third of excess air passed through the cigar, so good an instrument, as a stove, was it. He took it that few stoves had that efficiency. Most of them passed a good deal more waste air, and there was a ratio of dioxide to monoxide of 2 to 1—only twice as much dioxide as monoxide. They analyzed that, and he believed there was 6 p.ct. of carbonic oxide. The better cigar gave more. Fancy half-a-dozen aristocrats going to town in a first-class carriage! Consider the atmosphere! They ask themselves whether the small amount of carbon monoxide they got in ordinary circumstances was likely to harm them. He thought it reflected a good deal on the smokers. One of the most distinguished physiologists had told him a few weeks ago, when he had reproached him about excessive cigarette smoking, that he could always detect carbonic oxide in his blood. He was sure that could not be good for people. Passing from that, one reason he was so pleased was that they had had evidence of the chemist appearing in the industry. A good deal had been made of sulphuretted hydrogen. He thought there was a little bit of camouflage there. He did not think it was necessary to pay any attention to sulphuretted hydrogen, any more than the gas people were paying to it. It was the sulphur which was in the sulphuretted hydrogen, which could do far more harm than the carbonic oxide when it got out. He had objects which had been exposed to the gas, and they had showed a most serious deterioration under the influence of the sulphur. The man who had been striving to get rid of that was Dr. Carpenter. He had done a great work there, and he had heard that this work was being carried on and was likely to be improved upon; and they all looked to him to remove that last disability from gas. If they could get it free of sulphur, he believed there would be very little to be said about it. Dr. Bone had at the back of his head something more important than the poisoning effect of the carbonic oxide. Dr. Bone had at the back of his head the thermal value of the gas. All over the country there was an attempt to persuade people to the view that a low thermal value would bring us down to the water-gas level, if possible. He was sure this was not the case. What was wanted was a gas of as high a thermal value as possible, if they were going to improve gas appliances and make gas more suited for use in the future. There had been a good deal of discussion recently on the subject of food. One thing we had to realize was that our food is nothing like so good as it was, because of the way it is cooked. Unfortunately, we had taken to the gas-stove. If we could get back to the gas-cooker on the lines of the open range of the past, we should gain immensely. The wonderful burner produced by Dr. Bone some years ago was of that order. They had from it a blazing surface, which was superior to that of the old-fashioned stove. Nothing could be more perfect for use in grilling and roasting. Unfortunately, it lit-back; and the more carbonic oxide and the less methane they had in the gas, the more easily the gas flame would strike-back. The problem of getting an improved pattern (he believed) lay in he direction of getting an improved gas. With regard to smokeless fuel, Mr. Evans had been pleading in favour of fuel made by using up the nasty coke the gas industry produced. Prof. Boys might be able to use it, because he had an eye, and was prepared to use his wits; but very few people were, and they were not going to burn coke with the same facility as he burned it. After all, what was the amount of coal used by gas companies, in comparison with the total amount used? About 10 p.ct. Really, it did not very much matter what they did with their coal; but we were not going to treat the rest of our coal in the way the gas people treated it. We could not get anything out of it which was of any value to us. Therefore, we should have to distil it in a way which would enable us to get as much oil as we could out of it. There was no need to discover new uses for low-temperature oils. We knew they could be used. We must distil the greater part of our coal if we were to supply ourselves with any home supply of oil. Then we should get a fuel which we could use. Prof. Boys had spoken of small coal. If they stored that small coal for any length of time, it deteriorated, became oxydized, and very little oil was obtained from it. This was one of the most remarkable things in connection with coal. If they carbonized it at a low temperature they got a material which would keep, apparently, for a long time. It had been kept for ten years, and had not changed in the slightest, so that we could stabilize our coal and be able to make it into a material comparable with the largest and best coal. At the same time, we could produce the gas required, and make gas of the quality Dr. Carpenter was bent on giving to the public. His view was that whatever the gas industry might choose to do now, in the long run they would be forced to become makers of low-temperature smokeless fuel, and obtain gas in so doing. Gas would be a bye-product. We should then get rid of the profiteering coal merchant, and introduce all sorts of advantages. One curious outcome of that would probably be that the dyestuffs industry would go, unless materials were made in other ways than from coal tar.

Mr. T. GLOVER said they were told of some very novel methods of curing the smoke nuisance sometimes, but it was forgotten that the gas industry is already contributing in an enormous degree to the reduction of town smoke. It was forgotten that the industry is producing in the solid form something like 8 million tons of coke, that for the most part coke is used in our own country, and must be contributing substantially to the reduction of smoke. It was quite easy to see that if those 8 million tons of coke were not there, 8 million tons of coal would have to be used, which would produce a very considerable quantity of smoke. Also, it would produce a very considerable quantity of sulphur, which would be turned into the atmosphere and converted into sulphuric acid; so that the gas industry was doing another important duty in extracting sulphur and making it into sulphuric acid, in sulphuric acid chambers, and using it in the industry. It was also forgotten that of the 20 million tons of coal carbonized in gas-works, something like 10 million tons was required for fuel purposes. No one could show the industry that low-temperature carbonization was a commercial process; and unless it could be made a commercial process, it was of no use whatever. They had in coke a very valuable smokeless fuel; but they needed the precision of the chemist to remind them that when they sold coke they should sell coke, and not coke and water, or coke, ash, and water. Ash depended on the origin of the coal, and more care should be taken in the choice of coal for gas making if a good finished product in the form of coke were to be obtained. The ash originally in the coal was concentrated in the coke; and therefore, weight for weight, they got more ash from coke than from coal, whichever way it was carbonized. To remove the excess impurities from gas coal was a very important function of the colliery owner. That had not been sufficiently impressed, especially in some of the coalfields from which the great London companies drew their supplies. The Yorkshire coalfields had put down modern coal-cleaning plant, and had reduced the ash in the coal very considerably, to the great benefit of the coke. It was no use making good coke, fairly free from ash, if it were treated as a residual. It was too often treated as a residual. It was taken from the retort-house and dumped in a heap, and when it rained it absorbed a great quantity of water. The user had to drive that off by the heat of his fire. The chemist must come to the aid of the gas engineer in this matter, and must impress upon him that it is no use making this beautiful fuel—at least, it would be very much better if he took more care, after producing it, to store it under cover, to grade it, and fit it for the consumer, in order that he might realize the very greatest number of thermal units from it when he burnt it. There was one other point. This was that the coke produced from the vertical retort was made absolutely dry; and if it were kept in that condition, those who were conducting experiments (such as Prof. Boys) would find that the fuel they would be able to obtain in the future would ignite much more readily and burn much more cheerfully without the spitting and other unpleasant results obtained when burning ordinary coke. The coke from vertical retorts, particularly from continuous vertical retorts, would produce a cheerful fire, and would ignite fairly easily when the fire was first laid. He was glad to see the South Metropolitan Company had overcome the naphthalene bogey. It was very gratifying to find that the oil-washing process (advocated for many years) was so very effective when applied in a proper, thorough manner, as was done under Mr. Evans's control. The paper was so full of interesting matter that he thought the discussion should be adjourned.

Mr. THOMAS HARDIE (President of the Institution of Gas Engineers) expressed the very great pleasure with which he had listened to the lecture, and his indebtedness to Mr. Evans. As to carbon monoxide, it was known to those who produced gas that for the last eight years there had been as much carbon monoxide in the gas as there was to-day. Somebody had thought that—from the fact that there had been a report on carbon monoxide, which said that the gas industry could go on producing gas in the same way that they had before—they were increasing the proportion of carbon monoxide in the gas. This was not the case. The fact was that for the last eight years there had been on many occasions, over long periods, very much higher percentages of carbon monoxide than there was in gas to-day. As to low-temperature carbonization, he did not think gas engineers would ever agree to become oil producers. They were out for gas, and it was their intention to make gas; and though in its production they might produce oil, he believed they would continue to be, first and foremost, gas engineers.

Mr. BROWNLIE said it seemed to him the whole thing lay between low-temperature and high-temperature carbonization. Mr. Evans, of course, was for high temperature, with the object of making gas. Personally, he thought it was wrong. Looking at the history of the gas industry, from the time of its inception, temperatures had been gradually increased, in order to get more gas. They kept heating and heating, getting more and more gas, but making it weaker and weaker. In the days of his youth, when gas taps were opened the gas whistled as it came out; to-day it did not. It used to give candle power; to-day nobody would accuse it of giving candle power. He took it the ideal was to get 50,000 c.ft. from a ton of coal, with 30 p.ct. of carbon monoxide. All he could say was, God save the country!

Mr. EVANS, replying to the discussion, said there had not been many questions asked. The discussion consisted mostly of statements of views, and of facts. As to Dr. Haldane, he was immediately on his knees to a gentleman of such renown. There was one matter he would like to make clear. He had not suggested that the miner had a shorter life than anybody else. His point was rather that the lungs did become contaminated as he had indicated; but he would now like to ask whether they would rather have clean ceilings or black spit. [Laughter.] Prof. Boys' remarks with regard to the froth flotation process were of considerable interest. The particular sample of fuel which was burning downstairs in that building had been treated by the process. As to Prof. Armstrong, he was, in Mr. Evans's opinion, the greatest living chemist. They had often talked together about low-temperature carbonization. This process was certainly an interesting one; and the fuel made was a fine material for the domestic hearth. These conversations with Prof. Armstrong and the results of his examination of low-temperature fuel, had caused him not only to advise the gas industry to beware of competition in the future from this material, but had stimulated him to work-out the manufacture, as a gas-works bye-product, of a domestic smokeless fuel. He believed he had been misunderstood by Mr. Glover, because he was assuming that in the future the domestic raw coal at present delivered to a town should first be dealt with at the gas undertaking, which would then deal with a larger quantity of coal, obtaining cheaply a greater output of gas. He suggested that the gas industry could deal not only with the industries it was dealing with now, but also with the domestic fuel industry; for he felt certain that a time would come when a low-temperature carbonizing industry would come about if the gas industry did not take the steps to secure it.

At the conclusion of the meeting, a very hearty vote of thanks was accorded Mr. Evans.

Pfeifer Straw Gas.

Mr. Gilbert A. Brattland, of Fargo (N.D.) has communicated to the "Gas Age-Record" some information with regard to the Pfeifer straw-gas process to introduce which endeavours are being made among farmers in that district. He says there is at Fargo a machine that will take 150 lbs. of baled straw. A test was recently made with this machine, placing this amount of straw in the retort. In 33 minutes the gas was driven out of this straw, producing 850 c.ft. Some 148 lbs. of straw were used as firing material. The production of gas from straw runs from 10,000 to 12,000 c.ft. per ton of from 440 to 469 B.Th.U. Some other vegetable materials will produce more gas. In addition, bye-products of creosote water, light oils, and tars, as well as carbon, are produced. It is stated that sunflowers produce per ton 15,000 c.ft. of gas, 10 gallons of light oil, 10 gallons of tar, and 640 ibs. of carbon. Referring to the straw gas, it is stated that an analysis was made by Prof. Harding, of the University of Minnesota; and this gave the following result: Carbon dioxide, 30·6 p.ct.; ethylene, 6·4 p.ct.; carbon monoxide, 28·2 p.ct.; methane, 21·3 p.ct.; hydrogen, 11·3 p.ct.; and nitrogen, 3·2 p.ct.—yielding a heating value of 469·23 B.Th.U. per c.ft.

Research Graduate Assistantships.

In order to assist in the conduct of engineering research, and to extend and strengthen the field of its graduate work in engineering, the University of Illinois maintains fourteen research graduate assistantships in the Engineering Experiment Station. Two other such assistantships have been established under the patronage of the Illinois Gas Association. These assistantships, for each of which there is an annual stipend of $600 and freedom from all fees except the matriculation and diploma fees, are open to graduates of approved American and foreign universities and technical schools who are prepared to undertake graduate study in engineering, physics, or applied chemistry. An appointment to the position of research graduate assistant is made, and must be accepted, for two consecutive collegiate years, at the expiration of which period, if all requirements have been met, the degree of Master of Science will be conferred. Not more than half the time of a research graduate assistant need be spent in connection with the work of the department to which he is assigned; the remainder being available for graduate study. Nominations to these positions, accompanied by assignments to special departments of the Engineering Experiment Station, are made from applications received by the Director of the Station each year not later than the first day of March.

Secretaryship of the Institution of Civil Engineers.—A dinner given by the President, Vice-Presidents, and Council of the Institution of Civil Engineers to the Past-President (Mr. John A. Brodie) was utilized to give tangible expression of the appreciation of the Past-Presidents and the Council of Dr. J. H. T. Tudsbery's 26 years of service as Secretary, and to welcome his successor (Mr. H. H. Jeffcott, B.A.I.).

SCOTTISH JUNIOR GAS ASSOCIATION.

(WESTERN DISTRICT.)

A largely attended meeting of the members of the Western District of the Scottish Junior Gas Association was held on Saturday last, in the Royal Technical College, Glasgow. Mr. JAMES CUBIE, the District President, occupied the chair. A practical and suggestive paper was read by Mr. Wm. Hogg, of Glasgow.

The following extracts have been taken from the paper,

DISTRIBUTION TOPICS.

In a town of any importance, if you are in any way interested in gas, about the first place you look for is the showroom; and if you are not interested in gas, the showroom should command you to look at it. What type of a man should have control of so important a section of our industry? Should he be a practical man, or theoretical, or with outstanding abilities in commercial knowledge? If he has not some practical knowledge, how is he going to deal with customers who insist on having a demonstration of what the appliance they are interested in is capable of doing? Is it not advisable that the various appliances should be shown under working conditions? A showroom superintendent must be able to display his goods to the best possible advantage, to the point of tempting the public to come inside to inspect, with the end of securing an order ever in view. Needless to say, he must possess a courteous manner and an unlimited supply of patience.

Next in turn we come to the man who superintends the fixing of all appliances, now known as the distribution or district inspector. In a distribution department, a great amount of its success or failure lies with him. He ought to be both practical and theoretical. He should have no difficulty in preparing any estimate, or giving advice to any consumer. He must also possess the confidence of his fitters, treat them fairly, but be firm. An inspector should receive all his orders from his superintendent or manager, and through no other channel; and he ought to be in the position to be able to carry out these orders to the entire satisfaction of the management and the consumers.

Unless the showroom has been erected within the last few years, we seldom find the pipes of adequate dimensions. It is true that many buildings were piped for lighting only; and with the advent of cooking and heating appliances, with their modern efficiency, the pipes are now overtaxed. But is that the only reason? Does our present-day gas not require pipes of a larger bore? There are many tenements comprising 24 to 30 houses with a $\frac{5}{8}$ in. or $\frac{3}{4}$ in. rising main, with $\frac{3}{8}$ in. lead branches; the combined register of meters being about 600 c.ft., and sometimes exceeding this amount. The wonder is that the consumer has any gas under such adverse conditions. Take another case of a large block of buildings, comprising 21 tenements of six and eight room and kitchen houses. Here you have a 1-in. branch, 15 ft. past the boundary wall reduced to $\frac{3}{4}$ in., thereafter supplying two houses of eight rooms and kitchens and four houses of six rooms and kitchens. It is quite common to find in one of these houses a No. 4 cooker, three fires, and a circulator—indeed, one known house has five gas-fires. Here you cannot expect satisfaction. In re-fitting any of those tenements, we require to take careful stock of all the uses to which gas is likely to be put, before we can determine what size of piping we are to use.

(1) You may have a tenement of 36 single-apartment houses. We should not expect the maximum demand for cooking to exceed 40 c.ft. Generally it would not exceed 20 c.ft. and 5 c.ft. for lighting.

(2) You may have a tenement of twelve one room and kitchen houses. Here you might feel more secure at fixing your cooker demand at about 50 c.ft.—heating, at 30 or 40 c.ft., and lighting at 20 or 25 c.ft., with the possibility of a gas iron.

(3) You may have a tenement of six houses, each comprising five or six rooms and kitchen. Here you would expect to use some gas; and your aim should always be an all-gas house, making provision for same. In this class of house, we should have four fires (allow 40 c.ft. for each); a No. 4 cooker with a total consumption of about 96 c.ft.; a circulator or geyser with 40 c.ft.; possibly a small radiator with about 20 c.ft.; and ten lights each with an average of $4\frac{1}{2}$ c.ft.—a combined total of 361 c.ft.

It is a safer plan to allow for the uses of gas extending, than to make the fatal mistakes of the past. Calculating from Pole's formula for diameter, we get the following results:

(1) 36 houses at 45 c.ft. each = 1620 c.ft. Distance 26 yards. 2·321 in. diameter.

(2) 12 houses at 110 c.ft. each = 1320 c.ft. Distance 32 yards. 2·229 in. diameter.

(3) 6 houses at 361 c.ft. each = 2166 c.ft. Distance 20 yards. 2·474 in. diameter.

I have selected the maximum.

While on Pole's formula for diameter, we will take two examples of distance.

(1) Three fires at 40 c.ft. each, the distance to the first being 51 ft., or 17 yards—all fires in the same direction.

(2) Same consumption at 40 yards distance.

We find the following Diameters: (1) ·7528 in. (2) ·8933 in.,

showing that the greater the distance, the larger must be the bore of the pipe.

Now we go from re-fitting old tenements to houses under construction; and about the first party we become acquainted with is the architect. I feel confident in stating that our appliances would have been installed in many more cases if we had been on more familiar terms with the architect. If the gas company are not installing the interior piping, then they must see to it that at least they supply all information as to sizes, positions, &c., and observe that their advice is carried out. We have suffered long enough from the ill effects of bad installations due to want of knowledge, bad workmanship, and inadequate size of piping—sometimes to save initial cost.

After some practical hints on internal fitting work, the author went on to say that the question of a meter delivering above its registered capacity, and how far above it can go without the register being turned against the gas company, would provide ample discussion. Certainly the subject is having expert consideration; but a debate on existing conditions would prove very interesting. Still another subject closely related to this is ever present—namely, the maximum and minimum number of appliances in use at one time. A district inspector, in arriving at an average estimate, must study and understand the nature of the consumer.

Next the author exhibited a sketch of a method advocated by him for the fixing of meters; and this was succeeded by the following remarks on gas-fires: We have every reason, as an industry, to be pleased with the great advancement made in recent years, for which we are indebted to the makers for their unceasing striving in bringing this form of heating to its present state of efficiency. A very easy axiom to remember is: Heat the body but keep the air cool, or heat the walls; otherwise the walls will derive their heat from the body. The fixing of fuel plays no small part in the heating efficiency. It is advisable to fix fuel so that it will remain in position in spite of vibration. This could be easier obtained by its standardization. We cannot have failed to see the ill effects of using another maker's radiant, which is unsuitable for the fire in which it is placed. Radiants should not slope backwards; and the open side should be to the front, to assist radiation. Examine the old type of fire, with its small round flue-outlet, and the pockets in the canopy; and contrast it with the modern, *minus* the pockets in the canopy, and its large oblong flue-outlet. If possible, avoid curtailing the flue-outlet under the maker's standard, and always take careful observations of how many windows are in the apartment you wish to heat; also if any of the walls have a northern exposure. We should gain by an immediate withdrawal of all fires which have a small round flue-outlet, and replacing them with up-to-date types, which would prove the best advertising agents.

In any calculation I have made, you will have observed that I referred to lighting. I am certainly not of the opinion that gas for lighting is played out. I firmly believe that, if we had more up-to-date practical exhibitions of lighting in shops or buildings where the public congregate, it would advertise itself. I have recently witnessed the transformation caused by the introduction of up to-date lighting in a church. Fortunately, the church building being modern, the piping was of adequate dimensions. The lamps selected were Sugg's "Carshalton" type, each with eight mantles and distance controller, which allows the installation to be worked with as much ease as the best electric installation. The burners under the gallery are Sugg's inverted, with parabolic reflecting shades, raised to a height of 7 ft. 6 in. from the floor level by altering the bracket to a swan neck pattern. The main riser in the corridor above and below the main cock is bye-passed, and a mercurial governor fitted on the inlet of the meter. The magnificent result obtained has, I am sure, gone a long way to enhance the reputation of gas lighting.

Now let us glance at domestic lighting, and we shall discover that there is abundant room for improvement. In the average kitchen a ¼-in. lead pipe supplies the bracket, often a distance of 50 ft. or more from the meter. Yet we find a ⅜-in. branch-piece inserted immediately above the bracket drop-screw, with a ⅜ in. pipe branched off to supply a ring or grill. Now, ring and bracket are invariably in use at the same time; the result being that neither gives satisfaction. Standardization of burners and mantles would prove very beneficial, as there are too many makers of shoddy types, which do gas an injustice. In Glasgow, 90 p.ct. of the kitchen brackets are fixed to the mantelpiece. Is this not a mistake? The mantle is subjected to undue vibration, and consequently its life is brief. We have alternatives—a bracket fixed to the wall or suspended from the ceiling. After we have settled this defect, we have to decide the vexed question of maintenance. As the results of our failure to adopt such a scheme are so glaring and well known, I can only hope that the obstacles preventing its introduction may soon be swept aside.

In conclusion, I make an appeal to our country members on behalf of our industry. Where they have the game all to themselves, so to speak, let them put forth every endeavour to retain their hold upon their consumers.

DISCUSSION.

The PRESIDENT said he could not quite grasp the point the author appeared to make at the outset about showrooms where the appliances were not seen in actual operation. To his mind, it appeared an altogether strange thing that they should have a showroom where appliances were not actually working. It had always struck him that if a consumer wanted anything the first thing he or she would be likely to do was to go to a showroom where the particular appliance could be seen working under a practical test. On the distribution side of the question, Mr. Hogg instanced many cases where gas-fires and gas-cookers had been installed, and where it was found that the meters were not of sufficient capacity to carry these extensions. The author wondered who was to blame for this state of affairs. It occurred to him that something had surely been very far wrong when such appliances had been fitted in premises with, he assumed, the approval of the district inspector. Of course, a gas department could not get on very well if it was kept installing appliances into premises where it was known that the pipe would not meet the demand. He had hoped that a much different state of affairs prevailed to-day; and he was rather surprised to find this particular reference in Mr. Hogg's paper. The author had also touched on the need for some new kind of "sitting" for meters. On this point it had always seemed to him that the present "sitting" they had for meters was eminently satisfactory. As things were, there was no strain at all on the meters, and certainly not such a strain as would be sure to happen if a meter were fixed on a wall with lugs as suggested by Mr. Hogg.

Mr. A. B. MUNRO thought that the fault referred to by Mr. Hogg in regard to finding meters of insufficient capacity was not altogether one for which the district inspectors could be held blameworthy. From his own experience and observation, he was inclined to the view that the fault was not with the gas department but rather with the meter inspectors. In connection with one of Glasgow's housing schemes—the one at Riddrie, he believed—an enormous sum of money had been spent in installing what might be described as needless electrical fittings. He advised the members of the Association to make themselves conversant with what was going on at that particular housing scheme, and to register a protest in the public interest. An endeavour had been made to get data by which a comparison would be made of the cost of electricity and gas for these housing schemes; but so far as the scheme he had in view was concerned, this information was not forthcoming. They ought to make a strong stand for these figures, because he was convinced that gas would be shown to be the cheaper installation.

Mr. J. M'ISAAC (Glasgow) ventured the opinion that the services of a district inspector could not be overrated; but he did not agree with the author when he said that such an official should have no difficulty in preparing estimates and giving advice to fitters. In his opinion, it was just there they reached the stumbling block—viz., that of a district inspector supervising more than he could conveniently tackle sometimes. He was ready to concede that the hints Mr. Hogg had given in his paper relative to the placing of meters were worthy of further consideration, and he personally would very much like to see these points fully investigated and inquired into.

Mr. ARCHIBALD WYLIE (Glasgow) said that if Mr. Hogg was to be taken literally in many of the suggestions he had made, then it was quite apparent that the district inspector or manager was going to have a particularly busy time of it. He especially appreciated the point the author had made in his contribution, because he understood that when a burner of a cooker was increased individually it consumed more gas than when it worked in combination with all the other burners in the cooker.

Additional contributions to the discussion were made by Messrs. CURRIE, STOLE, PATTERSON (all of Glasgow), and others, and points of criticism were replied to at the close by Mr. HOGG.

Delivery to Small Coke Consumers.

A recent number of "Das Gas- und Wasserfach" contained an interesting description of the way in which the Karlsruhe Gas Works had solved their difficulty of delivering coke in small quantities to householders. Instead of the old system of sacks or baskets, the price of which has become prohibitive in Germany, they now have in use seven large containers or tanks. These are made of sheet iron, each weighing about a ton, and have a holding capacity of 3½ to 4 tons of coke each. They are so constructed that they can be used on an ordinary flat cart or lorry. Each is provided with four shoots, which are fitted with hand-manipulated slides for opening and closing, secured with patent safety fastenings. Under each shoot are hooks, on which are hung the tubs by which the coke is delivered into the houses. These tubs are fitted with strong shoulder-straps, and are easy to carry; each holding a zentner (about a hundredweight) of coke. Sales are nominally by weight, and scales are carried to enable a check to be taken at any time, though the easy manipulation of the slides renders possible very accurate filling of the tubs. The whole container is filled at the works from the coke-hopper in five minutes. Each delivers an average of 14 tons a day, served by two men besides the driver, and some 1750 tons are being delivered monthly in this way in the town and district. Besides the great saving in the cost of sacks and baskets, a considerable saving is effected in wages for filling them. It is claimed that delivery is easier and cleaner, and that the system is very popular with the men.

Romance of Artificial Lighting.—On March 30, at 5.30, in the Guildhall, Mr. W. J. Liberty, Public Lighting Inspector of the City of London, will deliver a lecture before the Corporation of the City of London Staff Association on "The Romance of Artificial Lighting."

Research in Industry.—We have to acknowledge a fresh addition to Pitman's Industrial Administration series of books. The new comer is "Research in Industry: The Basis of Economic Progress," by A. P. M. Fleming, C.B.E., M.Sc., and J. G. Pearce, B.Sc. (Eng.). The price is 10s. 6d. net. A fuller notice of the book will appear later.

CHEMICAL WORKS OF THE SOUTH METROPOLITAN GAS COMPANY.

Visit of the London and Southern District Junior Gas Association.

A good attendance can always be relied upon when visits are arranged to the East Greenwich works of the South Metropolitan Gas Company; for it is well known that there is much of value to be gathered from an inspection of the plant and processes in operation there. Thus it was no surprise to find a large party of members of the Association assembled there last Saturday afternoon. The works cover so huge a site that one can hardly expect to go carefully over the whole of them in the course of a single visit; and on this occasion attention was confined to the chemical works at Phœnix Wharf, which are really distinct from the gas-works.

Before passing to a detailed account of the visit, mention must be included of the preparations made by the Company for the convenience of the visitors. The members assembled at the Institute at East Greenwich, and were conducted by Mr. F. A. Frost (the President of the Association) to the entrance to the chemical works in River Way. Here the party were met by Mr. P. Parrish (the Manager) and his assistants, and arrangements were made to divide the total of visitors into parties. Each party had its own conductor, in the persons of Messrs. Parrish, Weight, Snelling, and Kirby, and its own route as shown on a plan exhibited at the gate. A start was promptly made on the tour, which was all set to time-table. This worked very efficiently, enabling each party to view comfortably the installations, without undue crowding or confusion. Under the able guidance of Mr. Parrish and the other gentlemen named, an afternoon of absorbing interest was spent. All were fully prepared to see much that was novel, but it is probably safe to say that no one unfamiliar with the works had any idea of the number and completeness of the different processes carried on. It is impossible to say at what point of the visit the highest degree of interest was aroused; for no doubt different points made special appeal to different members. There were, however, certainly two things by which all the visitors were particularly impressed, and these were the fullness and clearness of the explanations given by Mr. Parrish and the other guides, and the excellent quality of the sulphate of ammonia, the production of which they were enabled to follow from the earliest stages to the final bagging and placing in barges.

Ammonium Sulphate Plant.

The first installation visited was the ammonium sulphate plant, consisting of three separate units, each comprising two sets of stills (free and fixed) capable of distilling 60,000 gallons of ammoniacal liquor per day of 24 hours, or 180,000 gallons in all. Each set consists essentially of preheaters, stills, saturator, and condensers, which are combined with the preheaters.

The stills, which are to the special design of Dr. Carpenter, are of a particularly efficient type. The essential features are (1) the absence of external cleaning manholes, thus enabling the stills to be efficiently lagged; and (2) the hoods and "bubblers" are of a unique type, admitting of a large wetted surface and fine division of the steam-ammonia, and efficient agitation of the liquor in the sealed trays. The liming chamber allows of admirable time contact, the milk of lime being introduced tangentially at the foot of the still, and ascending an outer annulus before accumulating in an inner chamber, and overflowing to the fixed still. The arrangement of the fixed still is similar to that of the free still, except that the "bubblers" are perforated in the latter case, whereas serrated "bubblers" do duty in the fixed still. The liquor, having been preheated to 99° C., passes to the free still, where the volatile ammonia (about 80 p.ct. of the total) is expelled by steam. The gas liquor containing the fixed ammonia is thoroughly incorporated with milk of lime, and subjected to a further application of steam in the fixed still, in order to release the remaining ammonia. All the ammonia passes through the column, and thence to the saturator, *viâ* cracker pipes.

Chemical combination takes place between the ammonia and sulphuric acid, yielding crystals of sulphate of ammonia, which are ejected from the saturator by a steam ejector, and dried in a centrifugal basket; and after centrifuging for two minutes to remove the acid mother-liquor, the acid-containing salt is rendered neutral by the application of the "Metro" process, and afterwards dried. There are three drying towers—two being of the gravitation shower type, and the third built on the lines of an ore-roasting furnace, where the material is moved by rotating rakes over circular wooden shelves in a current of hot air. The gravitation shower type of drying tower is rendered automatic in operation by the provision of a shelf at the top, which is provided with a central shaft, carrying arms and rabbles for introducing the salt to the tower in a positive manner. Similarly, at the foot of this type of drying tower a conical rotating table, with a stationary bevelled arm, projects the salt to a jigger conveyor feeding the elevator. By a simple device, the salt can be maintained in the tower circuit, or when desiccated to the standard imposed, can be discharged to an elevated conveyor and distributed to any part of the stores.

Two fans each discharge about 30,000 c.ft. per hour of air under pressure to two multitubular heaters, fired with coke. The hot air, at a temperature of about 200° C., is discharged into a common main, and leads are taken to each of the towers. Regulation of the volume of air can be controlled by the operation of suitable dampers. The air is introduced to the towers at a temperature of 150° C.; and thermographs, giving continuous temperature readings, are used to afford control. It has been found that the temperature of incipient charring of "deal," of which the towers are chiefly built, is about 200° C.

Of heat units full advantage is taken at Phœnix Wharf, wherever possible. Thus the softened boiler feed water is preheated by the effluent liquor to a temperature of 60° to 65° C. The devil liquor from the preheaters and condensers is returned to the stills, and is regulated by special means.

The visitors had an opportunity of seeing "Metro" sulphate being packed for dispatch. The whole of this "Metro" sulphate is screened in rotary hexagonal reels, provided with wire gauze equivalent to a hundred meshes to the square inch. The tailings are returned to the process to be specially treated. It was observed that the ordinary type of bag has been found unsuitable for "Metro" sulphate, on account of many bags emptying themselves through the apertures by reason of the "mobility" of the salt. Special horizontal close stitching has to be provided on the seams. The arrangements for maintaining the bagging shed and auxiliary stores at such a temperature as will effectually militate against the deposition of moisture from the atmosphere, were also noted. It was seen that every conceivable exigency had been provided for.

Sulphuric Acid Plant.

The next installation visited was the sulphuric acid plant. Here spent oxide is burned in four units of spent oxide burners. Each unit deals by self-combustion with 8 cwt. of spent oxide per hour, containing on an average 45 p.ct. of sulphur, or a total of 275 tons per week. The duration of combustion is twelve hours. The burners are hand-operated ones, designed to give dust-free gases.

The sulphur dioxide, along with nitrogen and oxygen, passes through the potting oven, disposed in which is a cast-iron pot, into which, at predetermined periods, nitrate of soda and sulphuric acid are introduced. Thus oxides of nitrogen are generated; and these intermix in the stalk with the other gases and pass to the Glover tower.

The Glover tower is irrigated with chamber acid and nitro-sulphuric acid (arising from the Gay Lussac tower; and these are distributed over a suitable packing medium. The hot gases denitrate the nitro-sulphuric acid, and also concentrate the chamber acid. The acid leaving the Glover tower is usually 148° Tw. (80 p.ct.), and emerges at about 160° C. The acid is cooled to 30° C., and then "blown" and distributed over the packing medium of the Gay-Lussac tower. The strong, cold 80 p.ct. acid absorbs the unutilized and regenerated nitrogen peroxide, thus forming the nitro-sulphuric acid.

The gases (sulphur dioxide, oxides of nitrogen, oxygen, nitrogen, &c.) leaving the Glover tower, pass to lead-lined chambers, four of which, 110 ft. long by 18 ft. wide by 16 to 17 ft. high, constitute a "set." In all there are four "sets" of chambers. Reaction takes place in the chambers; and to aid the formation and deposition of the sulphuric acid, steam is introduced into certain chambers in an atomized form. The process of acid manufacture is controlled by the temperature of the several chambers, by the specific gravity and nitrosity of the "drips," and by the colour of the gases in the chambers. The waste gases leaving the sulphate plant are combusted at the burners in suitable manner.

Mr. Parrish explained the steps which had been necessary to keep the water balance adjusted as between the sulphate plant and the acid plant, and drew samples of the actual make of Glover acid of excellent colour, containing only 0·08 p.ct. of iron. It was stated that the chamber acid was water white, and contained only 0·06 p.ct. of iron.

"Metroxide" Plant.

This plant was next viewed, and the manufacture of "Metroxide" described. The burnt oxide is regenerated by a special process; and a purifying material of good mechanical condition and special activity is manufactured.

Hydrochloric Acid Plant.

The party were then taken to the modified Deacon furnace and salt-cake pot; it being explained that the differential in the matter of draught was obtained by the operation of a fan at the tail-end of the process. There are three condensing towers in connection with the plant; two being built of Yorkshire stone and packed with bricks and metallurgical coke, and the other being constructed in a special way of wood (effectually tarred), and packed with refractory "propeller" packings. Salt cake of 96 p.ct. Na_2SO_4 is produced; and the major portion of the hydrochloric acid manufactured is of 31 p.ct. strength, and contains only four parts of arsenic per million. By reason of its purity, it is being used for special purposes.

The muriate of ammonia and ammonium chloride plants were the next objects of interest; the process of evaporation and centrifuging of muriate of ammonia being witnessed. Direct neutralization of concentrated ammonia liquor and hydrochloric acid is the basis of the process; special means being adopted to remove the precipitated iron and other impurities.

Nitric Acid Plant.

The nitric acid plant, which was finally visited, is of the Valentiner type, operated under vacuum by a special vacuum engine. There are two stills, in conjunction with which earthenware coils

are used in one case, and "Tantiron" coils in the other. A series of Woulf's bottles and condensing towers complete the condensation plant. It was remarked that the plant had the highest efficiency of any in the United Kingdom during the war, when all results were collated by the Ministry of Munitions.

Inspection of the lobbies and workshops, which are very complete in their equipment, was made on the way to the Co-partnership Institute, where tea was provided.

SOME SPEECHES AT THE TEA.

The PRESIDENT said the programme for the afternoon had been rather different from what it was originally hoped to be able to arrange. An endeavour had been made to include a visit to the adjacent Fuel Research Station; but when the application for permission to do so was sent in by the Hon. Secretary, Sir George Beilby (the Director) was unfortunately away, and so the matter could not be fixed up in time to be incorporated in the session's programme. He did not, however, think there would be any difficulty whatever in getting a visit to the Fuel Research Station arranged for some future occasion. It was about eight years since the members of the Association were at the East Greenwich chemical works, which were now quite distinct from the gas-works. In the interval, a good many changes had taken place in the works. The principal feature was the sulphate of ammonia plant, which dealt with the Company's whole production of ammoniacal liquor. In the last little while there had been important changes made in the method of manufacturing sulphate of ammonia. The Company had always attached great importance to the residuals as well as to the gas; and the members would have seen that the sulphate produced now was very different from what was formerly the case. No doubt Mr. Parrish would tell them something of the changes in the process that had come about. Thanks were due to the Company and Mr. Parrish and his assistants, who had given up their time in order that the details of the various processes should be fully explained to the visitors.

Mr. W. NEWTON BOOTH (Woolwich Arsenal) said they had spent a very pleasant and very profitable afternoon looking round these chemical works. The South Metropolitan Gas Company were taking the lead in many directions in the matter of improving their products; and it was very good of them to allow juniors the opportunity of seeing what was being done. They must congratulate the Company upon their success in tackling various problems with which they had been faced; and for this success, he was sure, Mr. Parrish was in a large measure responsible. He proposed a hearty vote of thanks to Dr. Charles Carpenter and his co-Directors for permission to go round the works and for their hospitality, and to Mr. Parrish and his assistants, who had expended so much time and energy on their behalf.

Mr. C. WRIGHT (Gas Light and Coke Company) seconded the vote, which was agreed to with acclamation.

Mr. PARRISH, in acknowledging the vote of thanks, expressed regret at the absence of Mr. E. V. Evans (the Products Manager), who had hoped to be present. He assured the members that it had been a pleasure to conduct them over the chemical works, and to show them some of their several activities. Their aim, as he had emphasized during the inspection of the works, was to produce chemical products of the highest standard of purity, in order that such products should create their own markets. He gathered from Mr. Frost that the last occasion on which the Association visited the chemical works was eight years ago. Since that time, the chemical works had been extended, and many developments had taken place. As the members had evinced keen interest in the production of "Metro" sulphate, he reviewed the circumstances which led to the investigation of the production of the high-grade quality of sulphate which they had seen. It was remarked that, after considering the merits and demerits of several processes, which they themselves had devised and worked on a semi-technical scale, they came to the conclusion that the method of neutralizing the acid-containing sulphate of ammonia with a weak solution of ammonia obtained by condensing a portion of the steam and ammonia from the fixed still, and applying such solution in the form of a spray under certain conditions of dilution and temperature, was an eminently suitable one, not only from the point of view of ensuring a definitely neutral salt, but one of admirable texture and tolerably good colour. The processes of neutralizing and drying had been made automatic in operation; and no additional men or staff were required beyond those who hitherto were engaged in the production of the ordinary quality of sulphate of ammonia. In this connection, Mr. Parrish referred to certain correspondence which had recently appeared in the Technical Press, which suggested that the "Metro" process was one involving a large staff of trained men and chemists. Such a suggestion was absolutely unfounded. Indeed, comment had been made during the inspection of the plant as to the paucity of "operatives." On the subject of the colour of "Metro" sulphate, about which many questions had been asked, Mr. Parrish indicated that the bulk of the impurities with which they had to contend were introduced *via* the gas liquor. The ammoniacal liquor supplied by their several gas-works was of very good quality as regards its freedom from heavy tar; but it contained varying small quantities of hydrocarbons of a specific gravity less than that of the gas liquor itself. He attributed the high quality and good colour of the sulphate to the scrupulous attention given to the details of the process. He pointed out that last year nothing other than "Metro" sulphate had been produced (about 13,000 tons), containing an average of 25·74 p.ct. of ammonia, and 0·04 p.ct. of moisture, every ounce of which was absolutely neutral. Such figures were eloquent testimony in themselves to the success of the process. Finally, he expressed his personal thanks to Messrs. Weight, Snelling, Kirby, and Gibbs for the way in which they had conducted their respective parties round the works, and for the interest they had displayed, without which the visit could not possibly have proved such a success.

Subsequently, there was an exhibition in the Institute of the film which the Company showed to the members of the Institution of Gas Engineers when they were at the works last year. This depicts a number of the operations of the Company, some of the showrooms on the district, and various extensive industrial uses to which the Company's gas is put.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

Visit to the Works of Messrs. John Ruscoe and Co., Ltd.

Members of the Association, to the number of sixty, last Wednesday visited the works at Hyde of Messrs. John Ruscoe and Co., Ltd. They were welcomed to and conducted round the workshops by Messrs. Kenyon and Wood (Directors), and Higginbottam, P. Kenyon, and Hutton.

The works were founded in the year 1865; and at present the firm employ 112 men in the shops and foundry, the latter being at Newton. The members were shown various types of main-laying and service tools—particularly the under-pressure drilling apparatus for gas and water mains. A special machine for the facing of retort mouthpieces *in situ* was seen in operation by hand. The machine is of simple character, and can be handled with very little expenditure of labour. The firm's method of inserting a valve within an existing main was demonstrated by means of drawings. The actual process could not be shown that afternoon, owing to a large time-contract for India being in the shop. The time for completion of the contract being near at hand, they had not been able to fix up the apparatus. In the workshops were to be seen rope pulleys of all sizes; this being another branch of the business, as also is that of making mechanical stokers.

The firm invited the party to tea at an adjoining café. After tea Mr. Nicholas (Blackburn) moved a vote of thanks to them for their kindness and hospitality, and remarked that anything on the distribution side of the profession never came amiss. Mr. C. H. Bamber, B.Sc. (Bolton), seconded, and said he had been impressed by the admirable way in which the firm had come to the aid of the industry, in assisting them to overcome some of the distribution difficulties. The method of valve insertion in a live main was unique. Mr. Kenyon and Mr. Wood replied on behalf of the firm.

Mr. J. Albinson, B.Sc. (Manchester), then gave an interesting and scientific discourse on the "Combustion of Coal," which was listened to with great attention. The author, however, was not desirous of having his remarks published. The members one and all were of the opinion that this was a distinct loss to the Association, and to the profession generally. Messrs. Battersby (Bury), E. Crowther (Wallasey), J. Hailstone (Rochdale), and H. C. Applebee (Manchester) contributed to the discussion. Mr. Hailstone moved, and Mr. Lee (Oldham) seconded, a vote of thanks to the author for his discourse.

SAMPLING AND ANALYSIS OF COAL COMMITTEE.

The Fuel Research Board of the Department of Scientific and Industrial Research have appointed a Committee to advise upon the sampling and analysis of coal. The personnel of the Committee is as follows:

Prof. THOMAS GRAY, D.Sc., Ph.D. (Chairman).
Prof. J. W. COBB, C.B.E., B.Sc.
Mr. J. T. DUNN, D.Sc.
Mr. J. S. FLETT, O.B.E., D.Sc., LL.D., F.R.S.
Mr. G. NEVILL HUNTLY, B.Sc.
Mr. S. ROY ILLINGWORTH, M.Sc.
Mr. J. G. KING, F.I.C.
Mr. C. H. LANDER, D.Sc.
Mr. R. LESSING, Ph.D.
Mr. C. A. SEYLER, B.Sc.
Mr. F. S. SINNATT, M.B.E., M.Sc.
Prof. R. V. WHEELER, D.Sc.
Secretary—Miss N. RENOUF, F.C.S.

It is intended that the methods recommended by the Committee shall be adopted in connection with the Physical and Chemical Survey of the National Coal Resources.

Communications for the Committee should be addressed to the Secretary at Nos. 16 and 18, Old Queen Street, Westminster, London, S.W. 1.

Recent Wills.—Mr. John Delaney, who was Chairman and Managing Director of Messrs. W. J. Jenkins & Co., Ltd., of Retford, has left estate of the gross value of £238,053. Mr. E. J. S. Fassnidge, a Director of the Uxbridge Gas Company, has left estate of the value of £31,193.

A New Dye Discovery.—The Toronto correspondent of "The Times" announces that a new chemical reaction which can be employed for making dyestuffs from coal-tar products has been discovered by Prof. Maitland C. Boswell, in the course of his research work in the chemical laboratory of the University of Toronto. Two compounds belonging to a new dye group—one a blue and the other a beautiful shade of rose—have been produced, and methods devised for their preparation and isolation in a pure state on a manufacturing scale. With several of his advanced students, Prof. Boswell is now engaged in fixing definitely the chemical constitution of these new compounds, and the best conditions for applying them to cotton, wool, and silk. The dyes are basic, and of high tinctorial power, giving beautiful dyes on silk, fast to light and washing. Other applications of the general reaction are also being investigated.

ROBINSON'S MIXED GAS OR COMPLETE GASIFICATION PLANT.

Working Results at Richmond (Yorks.).

This plant, an account of which was given in the "JOURNAL" for May 11, 1921 [p. 327], consists of six "single" retorts, 21 in. by 15 in. by 7 ft. long, Ω shaped, set in an existing arch. The engine and blower are fixed in the retort-house near the plant. The retorts are charged by hand and, when the coal is carbonized, are easily discharged by the coke being pushed out into the generator behind. All the valves controlling air and steam are operated by one lever.

This plant has now been in operation since the middle of November without being let-down. Two regenerator "single" settings have been working alongside for 24 hours a day while the "Robinson" setting has been working one, two, or three shifts a day as occasion requires. The coal carbonized has been Durham and West Yorkshire unscreened.

Mr. W. Hemingway, the Manager of the Richmond gas-works, gives the following average results for the months of January, 1921 and 1922.

	Jan., 1921.	Jan., 1922.
Gas made, c.ft.	2,823,200	3,121,400
Coal carbonized, tons	244·5	205·9
Gas made per ton, c.ft.	11,570	15,152
Quality (gross average)	14 candles on jet (about 530 B.Th.U.)	480 B.Th.U. (average of hourly readings).
Therms made per ton	61·4	72·8
Average make per day, c.ft.	91,071	100,690

The plant is regulated so that there is no cold coke to be fed into the generator, and no coke has to be drawn from the retorts. In other words, the coal charged into the retorts keeps the generator supplied with coke. The resultant gas produced from the plant itself, when using only its own production of coke, is about 380 B.Th.U. (gross). The coal carbonized during January, 1922, was divided between the retorts as follows:

	Tons.
Ordinary settings	173·5
Robinson's settings	32·4
Total	205·9

Steam is supplied from the existing boilers at about 50 lbs. pressure. On the 9 days during January when the plant was working 3 shifts a day, the average make per ton from the retort-house was 16,745 c.ft. of 460 gas—equal to 77 therms per ton—in spite of the heats on the coal-gas settings being very poor on 4 days.

As showing the completeness with which the blow gases are consumed in this type of plant, an analysis of the gases at the outlet pipe near the snift valve, made at Harrogate one day last week, gave the following results:

	P.Ct.
CO_2	17·6
O_2	2·0
CO	0·20

Messrs. Drakes Limited, of Halifax, erected the plant to the patentees' designs.

REPAIRING A RELIEF HOLDER.

An interesting account of a repair job on a water-gas relief holder at the works of the Rochester Gas and Electric Corporation is given by Mr. William N. Whitney, in the pages of the "Gas Age-Record." The holder, which was built some thirty years ago, and has a capacity of 400,000 c.ft., is a two-lift one; the top lift being 98 ft. 6 in. dia. and 27 ft. high, and the lower one 100 ft. dia. and 26 ft. 9 in. high. Some years ago a bad leak was discovered in the cup on one side of the holder. The cup was promptly filled with fireclay at this point, which prevented all the water from leaking out; but while this fireclay plugged the leak, it was still impossible to uncup the holder, because in so doing the leak would have been opened-up again. Accordingly, from that time on it was necessary to operate the holder with only one lift, thus reducing the working capacity by one-half.

At the time of lowest gas production last spring, a complete survey was made of the situation; and a crack about 50 in. long was located in the cup. To avoid the time, labour, and expense involved in the usual method of handling such repair work, it was thought that it might be possible to do the job without taking the gas from the holder. It was decided to put-on a $\frac{1}{4}$-in. patch-plate 8 in. wide by 62 in. long, with a millboard paper gasket. To put on this plate, however, it was necessary to work under 18 in. of water, and with only 3 in. clearance for the hand and arm for a depth of 21½ in. The leak was along the pitch-line of the rivets; and the first part of the work was to remove these rivets for the length of the patch. This was accomplished by cutting-off the heads of the rivets, and then punching-out the rivets by the use of a special tool. The patch-plate, shaped to the curve and contour of the holder cup, was drilled for ninety $\frac{7}{16}$ in. holes, and, with the gasket tied to it, was lowered into the cup, and held in place. The next step was to bolt in place the patch, which had gas at the back and water in front of it; and in doing this, recourse was had to a scheme of fishing for the bolts. First, a hole was drilled and tapped for a 1-in. pipe-plug at a suitable point in the holder sheeting. Then a small lead sinker attached to an 8 ft. length of fish-line was dropped through the hole lower down. A wire hook was inserted through the first hole; and was swung around until it engaged the sinker. The wire, sinker, and line were then pulled through the top opening; the sinker was detached; and the bolt, with its cast-iron washer and paper washer, was tied to the fish-line in place of the sinker. The bolt was next pulled into place, and the two washers and nut slid down the line. The nut was then drawn up on the bolt, and the fish-line cut off. This was the procedure employed in the case of each of the ninety bolts.

When the bottom bolts were in place, it was necessary to drill the remaining holes in the holder sheet. A special angle drill that would work in a 3-in. space was used for this purpose. Each end of the bolts was fitted with a cast-iron and a millboard washer, to ensure that there should be no leakage; and the bolts were drawn up to an even grip, to give a uniform pressure on the large gasket. By keeping the holder in a certain position after the repair had been made, it was possible to syphon the water out of the cup and examine the patch, when both plate and patch-bolts were found as true and workmanlike as if the complete job had been done above ground. Only two weeks were required to complete the work, which called for the use of many tools of special design.

THE RECOVERY OF LIQUID HYDROCARBONS.

Washing with Cresol.

[Dr. G. Weissenberger, of the Technische Hochschule, Vienna, in "Das Gas- und Wasserfach," Jan. 21, 1922.]

In recent times much has been said and written about the great importance of recovering liquid hydrocarbons from coal gas. Whereas the tar won in gas-works contains only about 3 p.ct. of these valuable products, which means 0·1 to 0·15 of the coal carbonized, the gas produced carries off about 10 times this quantity, or anything up to 1 p.ct. by weight of the coal. It would therefore appear economically of importance to gas-works of all sizes to recover, before the chemical purification, these products, which are required in large quantities not only for motor fuel, but also by the chemical industry.

NEED FOR IMPROVEMENT.

It has been the general practice in Germany, where the question has been tackled at all, to wash the gas with oils. In small works, the standard washer was adapted to take the washing oil in the last chamber; medium-sized works, which possessed naphthalene washers, used one of these for the purpose; and large works installed special separate plant. Experience has proved these to be unquestionably a paying proposition, even in small works where several undertakings can send their enriched oils to be jointly worked-up. But, however satisfactory may be the results so far achieved, the author considers that the process should be capable of improvement in several directions, chiefly in an increase in profits, and rendering it possible and desirable for even the smallest of undertakings to work it. In this sense, the cresol process of Brégeat marks considerable progress.

SOME ADVANTAGES OF CRESOL WASHING.

Hitherto, heavy oils or paraffin oils have been used as the washing media, effecting a physical solution of the hydrocarbons contained in the gas, and capable, therefore, of taking-up a fixed low percentage—some 2 to 3 p.ct. of liquid—and subsequently giving it up again under the influence of heat. As a continuous process, worked against the flow of gas, it can be made fairly efficient. But, owing to the comparatively low absorbent properties of the oil, very large quantities have to be used to produce a reasonable output. It is true that in some works, where sufficient apparatus enables the requisite quantity to be handled, an efficiency of 97 p.ct. has been reached. But in medium and small works the average is not more than 65 p.ct.

In the cresol process the washing medium used—technically known as crude cresol—does not effect a physical solution of the hydrocarbons, but forms easily cracked combinations with them. Consequently a constituent part—the dissolved gaseous portion—can be continuously taken away from its equivalent weight, and the absorbent properties of the washing medium thus always renewed. In practice cresol can be loaded with up to 15 p.ct. of its own weight of hydrocarbons. In this way it is possible, using comparatively small quantities, to extract the hydrocarbons with 100 p.ct. efficiency, and without the necessity of installing any complicated plant. The specific heat of cresol is only half that of water, so that it can be heated-up with low steam consumption, and cooled equally easily. This, combined with the smaller quantity of oil used, reduces the steam requirements to rather less than half the figure for the usual process.

DIRECT PRODUCTION OF MOTOR SPIRIT.

In German plants it has almost always been the practice with the old process to work-up first of all a light oil, which was sent away to be elsewhere worked-up further for motor benzole. This was only possible where the primary product could be submitted

still further to a rectification process. But the use of cresol as washing medium permits of a continuous and direct production of motor benzole, and obviates the installation of any special distillation plant. The chemical combinations, formed during the washing, begin to split-up at a temperature which is above the boiling-point of the hydrocarbons absorbed, but considerably below that of the cresol. The result is a complete separation of the latter, and a simultaneous cracking of the products, so that motor benzole is produced direct. The steam consumption is about 3 lbs. per pound of the finished product, which is about one-half of the quantity required in the ordinary process with the best plant and good working.

Suitability for Small Works.

A great advantage of the cresol process is that it can be made entirely continuous, and that even quite small works can be fitted with a complete plant, without the necessity of sending away the saturated washing oil to be worked-up elsewhere. Considerable heat economy is possible; and the small, self-contained plant works at low cost in other ways. The small quantity of oil used allows of the dimensions of the plant being kept quite small, so that in some cases the process can be introduced where there is no space for others. Naturally, too, this smallness means low initial costs. German statistics have shown that benzole recovery by means of oil washing for works of under half-a-million cub.m. [17½ million c.ft.] per annum is on the borderland of profit or loss. But, however desirable it may be from the national point of view to recover all possible liquid hydrocarbons from gas, naturally small gas-works will not go to the expense of installing the necessary plant without the inducement of some commercial gain. This inducement, the author maintains, is offered by the cresol process. Naturally a small steam supply is a necessity; but this will generally be already available. In most cases building operations will be totally unnecessary.

Avoiding Naphthalene Troubles.

As regards naphthalene troubles, the very thorough washing that the gas receives in the cresol process is a beneficial influence. It is well known that gas washed by ordinary oil methods begins to take-up naphthalene from the big deposits in the mains, and, when this is partially re-deposited at cooler places, temporary stoppages occur at narrow connections and knee-joints. This will continue until the whole system is free of naphthalene. But the complete freedom of cresol-washed gas from volatile matter eliminates such unpleasant experiences. Pressure conditions are promptly and noticeably improved by this, as well as by the reduction in the specific weight of the gas; and the latter has also a beneficial effect on losses from leaks.

Continuity and Completeness.

A great disadvantage of the ordinary process of oil-washing is that non-continuous methods have to be worked, especially in medium or small works. Even in large works, "semi-continuous" plants are to be found. The considerable waste of oil, which is the effect of this, is obvious. The products of the first distillation contain generally 25 p.ct. of the washing oil, which, after rectification, has often to be run away into the tar-pit, and so sold considerably below its value. In other cases, it is sent away to be cleaned for re-use, or otherwise disposed of. These losses are avoided in the cresol process, which works in a complete and closed circuit. At one point, gas-washing is continually in progress; at another the volatile constituents are all the time being recovered. The only loss of cresol is the small quantity which, owing to its vapour tension, is dissolved in the gas; and even this can be obviated by including in the plant a soda receiver. The whole of the washing material is continuously circulating. The apparatus can be erected to work entirely automatically, and can be run under the general supervision of a boiler man or other workman. The conversion of existing plant to use with cresol presents no difficulty. If thought desirable, every item of the old plant can be retained, and only a few special additions made for its completion. There can be no doubt, the author states, of the profit from the process in question, which is estimated to exceed considerably that of other existing methods.

BENZOLE EXTRACTION.

Its Effect on Mains, Services, and Meters.

[Herr E. Körting, of Berlin, in "Das Gas- und Wasserfach," Nov. 26, 1921.]

In his introduction the author points out the importance of determining, before setting out to extract benzole from gas, whether the effect of the gas on mains, services, and meters is going to cut-out profits on the sale of the benzole. If it is true—and certain indications, especially in England, he says, point to it—that generally speaking the leather bellows of dry meters are seriously attacked, and the lubricating oil in the working parts hardened, by gas which is poor in benzole and of lower calorific value, it is going to be a costly business. But if wrought-iron house services are going to be damaged also, irreparable losses are being risked, since lighting consumers once lost are in his opinion unlikely to be recovered.

Struck with the importance of the question, Herr Körting has been at some pains to obtain reliable data on which to form an opinion. As regards the dry meters in use in his undertaking (lately the Berlin works of the Imperial Continental Gas Association), he has not been able to establish any perceptible damage. The meters are all of good quality, and manufactured by the undertaking itself. It should be noted, however, that the average age of those in use is, perhaps, 10 years, and in no case have they been in use more than 15 years. He refers to the experiences of some English undertakings, where considerable damage has been recorded, and to the measures, and even special apparatus, that have been introduced to prevent or remedy the state of affairs.

On the question of mains and services, it is much more difficult to form a sound judgment. In the first place, it is hard to record with any accuracy the degree and the rate of increase of any damage there may be. In the second place, it is not possible to note even the number of stoppages, unless these are attended to exclusively by the gas undertaking itself. In the case of that to which Herr Körting belongs, this has been done, as it has been the practice to clear stoppages free of charge. He is, therefore, able to give the following instructive table:

Gas-Pipe Stoppages Attended to per 100,000 Meters.

Year.	Whether Benzole Extracted.	Calorific Value B.Th.U.	Naphthalene Stoppages Before Meter.	Rust, &c., in Services after Meter.	
				Average.	In New District with 2/3 Dry Meters.
1910	No	601	1533	4510	..
1911	,,	597	1320	5208	..
1912	,,	597	1357	5263	..
1913	,,	596	1086	5632	..
1914	,,	594	1530	6300	1331
1915	Yes, from Sept.	580	2783	5265	790
1916	Yes	561	1576	6195	1518
1917	,,	524	1947	8729	1859
1918	Yes, till Nov.	509	1439	7685	1214
1919	No	505	1804	7253	1828
1920	,,	498	1431	6077	1064
1921	,,	500	1526	8015	1748

From this table it is seen that naphthalene stoppages vary within comparatively small limits. It is true that they were fairly high during the period of benzole extraction (the exceptionally hot year 1915 need not be taken into consideration); but even in 1910 they were high at 1500, and in 1919 at 1800, but subsequently diminished again. So that it is hardly possible to draw any very definite conclusions from the figures. But stoppages due to oxidation definitely increased in number during the time benzole was being taken out of the gas, and subsequently decreased in about the same proportion. For instance, the year 1920 shows more stoppages than 1914, although in the meantime the calorific value of the gas had been reduced from 594 to 498 B.Th.U. It may be said roughly that during the benzole-washing period they increased by 50 p.ct. But even so their number is by no means overwhelming, meaning as it does that every service has to be cleared once every twelve years, including those which are temporarily put out of use, and so are exposed to air. The serious increase in 1921, which was experienced also by other works, can be explained neither by benzole extraction, which was not practised, nor otherwise by the composition of the gas, which had not materially altered for five years. It can only be surmised that it was due to the very high temperature of the air causing more evaporation than usual in wet meters.

The author then proceeds to examine what are the principal contributory causes of this troublesome rusting action in mains and services. Doubtless the oxygen content of the gas has something to do with it, and this in turn depends to a large extent on the coal used. Formerly, when using English coal high in sulphur, Herr Körting found that 2½ p.ct. of air gave the best results in the purifiers. Experiments have shown that with German coal this can be reduced to 1½ p.ct. In order, then, to find out under what conditions oxygen acts on pipes, he had picked-up several lengths which had for a long time served the lighting in the works. In no case was serious oxidation found; only here and there a few small patches.

The author suggests that the most likely conditions to favour rust formation are the considerable admixture of water vapour to the gas, which is caused by wet meters becoming warm, and the reaching of the dew-point at certain cold points. In the latter case, it would be expected that the piping of street lamps would be particularly affected; and this indeed is the case. The only thing therefore, it would seem, would be to prove whether there are more stoppages in wet-meter services than in dry. In the last column of the table, the figures are for a new district where the great majority of the meters are actually dry ones. The stoppages, it will be seen, are far fewer. But then again the question arises whether this is due to the dry meters, or to the pipes being newer. It would be better if whole towns with only dry meters could be compared with others where all wet meters were used.

Then again, would a light smearing of oil in the pipes serve as a protection, and would such oil disappear if benzole were extracted from the gas, or a large percentage of water gas added? And could a suitable oil be found to replace water in wet meters?

And, finally, would the profit from benzole extraction pay for such protective measures, and still leave a margin of profit?

Such, without going into great detail, is the complex problem, technical and economic, as Herr Körting sees it. Its correct solution is, he considers, of no little importance. In conclusion, he asks assistance from any who can supply the results of actual experience—statistical material—or suggestions.

MAINTAINING SUPPLIES UNDER DIFFICULTIES.

At a meeting of the Gas Association of Silesia and Lusatia at the end of last year, as recorded in "Das Gas- und Wasserfach," some interesting experiences of gas managers were recounted with various fuels which they had had to carbonize owing to the coal shortage.

Herr Wilhelm, of Zittau, had for months on end been reduced to using in his vertical retorts 60 to 70 p.ct. of lignite, containing 40 to 50 p.ct. of moisture. Great damage to the retorts resulted, and no patching could save them from cracking right through. Peat and wood had also been carbonized, oil had been poured over the coals, and water gas had been made by steaming in horizontals. But all these emergency measures had proved more or less injurious to the retorts. Herr Eberle, of Liegnitz, spoke of the effect of lignite and peat carbonization on apparatus. The joints of a gasholder had become leaky, owing no doubt to something in the composition of the gas. Later, when the percentages of lignite and peat were reduced, the trouble was no longer experienced. The same speaker related his experiences with regard to laying-in the works and restarting them, which was quite an ordinary occurrence during the acute coal shortage. His custom had been to choose the right moment to shut-off the inclined retorts, draw them, and let them stand until fresh supplies of coal came in. Damage had inevitably occurred to the settings. He gave a warning—if possible, not to cut off the town mains; but, if inevitable, this should be done immediately after the governors. On starting-up again, he strongly recommended a considerably higher pressure than usual, in order to fill the mains and services as quickly as possible, and so avoid the accumulation of explosive mixtures.

Dr. Nauss, of Breslau, had also been up-against difficulties. To eke-out his meagre coal supplies, he had tried coal-washery refuse, lignite briquettes, and peat. The washery sludge alone was of no use. A mixture with an equal quantity of coal produced only 40 p.ct. of large coke; but with one part sludge and three parts coal the coke had been fairly good, containing 50 to 60 p.ct. of large. Lignite from various districts had been tried, but all proved too high in moisture, so that up to 50 p.ct. of liquor had resulted, with a gas of bad quality, containing quantities of carbon dioxide. The briquettes had given better results, producing 9000 to 10,000 c.ft. of 540 B.Th.U. gas per ton. The tar was not bad, though very different from ordinary coal tar. The coke was difficult to quench, and its uses restricted. The briquettes mixed with coal gave a fairly hard coke, and in the proportion of 25 p.ct. of them with 75 p.ct. of coal it was quite a satisfactory mixture. In the same way 20 p.ct. of peat briquettes could be mixed with coal without spoiling the coke.

In Ratibor, stated Herr Amelang, during the Silesian trouble, no supplies had been received from the collieries for eight weeks. He had collected all available coal locally, but had only been able to maintain the gas service during the last three weeks of the period by sending out 80 p.ct. of water gas.

PULVERIZED COAL IN AMERICA.

There has been issued by the Fuel Research Board of the Department of Scientific and Industrial Research a revised edition of Special Report No. 1, on the subject of "Pulverized Coal Systems in America," and written by Mr. Leonard C. Harvey. Copies are obtainable at H.M. Stationery Office, Imperial House, Kingsway, W.C. 2; and the post-free price is 5s. 3½d. From a prefatory note by Sir George Beilby (the Director of Fuel Research), it appears that, though the progress made in this country in the utilization of pulverized fuel has been disappointing, the study of the most recent literature on the subject made it clear that the use of pulverized coal had during the past few years been taken up seriously and energetically in America; and its use there continues to extend.

Mr. Harvey has made a thorough investigation in the United States of the position there; and the results are to be found in this revised report, which it is felt by the Fuel Research Board will enable the larger consumers of fuel to make a fairly complete preliminary study of the whole question, and to decide whether, for their own particular requirements, a case can be made out for a closer and more exhaustive inquiry into its possibilities. Among the advantages claimed for burning coal in pulverized form are: The heat values of coals can be utilized to a far higher degree by this means of firing than by any other process; in certain circumstances initial costs for pulverized coal plants are considerably less than the costs for installing producer-gas plants; and economy in fuel consumption of from 20 to 50 p.ct. can in many cases be effected by the use of coal in pulverized form. It is said that fuels carrying as low as 5 p.ct. of volatile combustible are now burned successfully in the boiler-house by this method.

With regard to the production of gas from pulverized coal, mention is made of the "Benner" system, in which an ordinary gas-producer is used as the generator. Pulverized coal is intermittently introduced into the hot zone at the top of the producer, and the volatile constituents driven off. This portion of the gas produced is therefore rich in illuminants. The carbonized dust falls on to the fuel bed in the form of coke and ash. The supply of pulverized fuel is discontinued and steam applied to the coke bed to form water gas and to reheat the upper portion of the producer. The resultant mixture of rich gas and water gas produces, it is said, an industrial gas of some 375 or 400 B.Th.U. It is claimed that total gasification of the carbonaceous constituents of any fuel is obtained, and the removal of the inert material in the form of ash or clinker can be readily accomplished. Mention is also made by Mr. Harvey of the "Trent" distillation system, which has been developed at the United States Bureau of Standards at Washington. This, though not essentially a pulverized coal system, is very closely allied. Under this process, the fuel to be used is first ground in water to a fineness of 85 p.ct. through a 200-mesh sieve. A quantity of oil is then added, amounting roughly to 30 p.ct. of the weight of the coal treated. This oil, it is claimed, forms an "amalgam" with the coal dust, leaving behind practically the whole of the ash. This "amalgam" is then subjected to low-temperature distillation for the purpose of recovering the added oil, together with a proportion of the volatile constituents of the coal.

The report, which is of a very full nature, is accompanied by a number of photographs and drawings, and should well serve the purpose which the Board have in view in its publication.

Bournemouth Gas and Water Company.

When submitting at the meeting next Friday the accounts of the Company for the year 1921, the Directors will report that these are presented for the first time to show separately the revenue accounts of the gas and water undertakings. The Provisional Water Order promoted by the Company was passed by the Ministry of Health and approved by Parliament in July last, whereby the authorized water charges were increased by one-third from Michaelmas last. The Company have also obtained from the Board of Trade an Order under the Gas Regulation Act, 1920, whereby a new standard price of 17·2d. per therm for 1921, and 16·2d. per therm thereafter, is substituted for the standard price of 4s. 6d. per 1000 c.ft. The effect of these two increases will be to distribute equitably between the consumers of gas and water the additional cost unavoidably incurred by the Company in both supplies, and to restore to a reasonable basis the dividends payable to the shareholders. The local authorities in the districts served by the Company appeared at the Departmental Inquiries held to deal with the applications of the Company; and the Directors are satisfied with the terms granted by both the Orders made. The results of the year's working have been adversely affected by the coal strike in the past summer; but the fall in the price of material and labour which has since taken place is assisting to a reduction in working expenses, and the Directors have reduced the price of gas as from Christmas last to 12d. per therm—a reduction of 3d. per 1000 c.ft. The business continues to expand. An issue of £100,000 in ten years redeemable 7 p.ct. debenture stock, made in October last, was largely over-subscribed by the proprietors and investors in the district of supply. An interim dividend at the rates per annum of 6 p.ct. on the preference, 7 p.ct. on the "B," and £4 12s 6d. p.ct. on the original shares was paid in August for the half year to June 30 last; and the Directors now recommend the payment of dividends for the second half year at the rates per annum of 6 p.ct. on the preference, 7 p.ct. on the "B," and £7 17s. 6d. p.ct. on the original shares, the dividend on the original shares being the full statutory dividend payable under the 1921 Order with gas at 4s. 9d. per 1000 c.ft. (12·66d. per therm), the price ruling in that year. All these dividends are subject to the deduction of income-tax, and, if approved, will leave to be carried forward a sum of £27,152. Provision has been made in the accounts for an increased distribution to the co-partners, consequential on the amended statutory provisions relating to the Company.

Carnarvon Gas Undertaking's Probable Deficit.—At last week's meeting of the Carnarvon Town Council, the Mayor (Mr. A. H. Richards), replying to complaints by Mr. Jarrett as to the unsatisfactory nature of the gas, said that, from his observation of the improved condition of things at the works, he was satisfied there would be no room for complaint a few days hence. The public did not seem adequately to appreciate the disadvantages under which all gas undertakings had been working of late. Undertakings not larger than that of Carnarvon had lost anything between £10,000 and £20,000; and the loss at Carnarvon would probably be between £1500 and £2000.

Gas-Fire Fatality at Pontefract.—A verdict of "Accidental death" was returned at an inquest on Helen M'Millan Beveridge (aged three years), daughter of the new Manager of the Pontefract Corporation Gas-Works. Mr. Beveridge said he heard a scream, and going upstairs saw the child come out of her bedroom with her nightdress on fire. He put out the flames with a blanket. In the room was a lighted gas-stove without a fire-guard; but he explained that he and his household only arrived in Pontefract on the previous Friday, and as his wife was taken ill the following day they had been unable to unpack the furniture and fix the fire-guard. He had, however, put boards round to keep the children off, and warned them to stay in bed. The Coroner said it seemed to have been an error of judgment to light the fire without adequate protection.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Late Mr. Isaac Carr, M.Inst.C.E.

SIR,—I would crave the indulgence of your columns to express, on behalf of my mother and the members of the Carr family, our heartfelt thanks for the very kind sympathy extended to us in our great loss.

We greatly appreciate the many tributes paid to the strenuous life and work of our late father in the gas industry, which have been conveyed to us in the many kind letters from individuals and representative bodies in the gas industry, and in the Technical Press.

64, *Aughton Street, Ormskirk,* W. M. CARR.
Feb. 13, 1922.

"The Five-Legged Rabbit."

SIR,—Mr. F. D. Marshall seems to have taken a leaf out of the book of the juggling hero of his childhood, when dealing with the figures obtained by my new process. His thermal balance-sheet goes to prove that its economy is greater than that of any other system. He does not say what plant these considerable and well-known figures refer to; but they are extremely bad.

Before I go any further, I may just as well tell my friends, and others, that I do not intend to publish more information about my new process than I can help, until we are well away with it. "A stern chase is a long chase." My Company are not over anxious about orders. Our works are running full time; and the order book is satisfactory. Mr. Marshall knows nothing whatever about my process, as his remarks on the methane content prove. He seems to be unaware of the fact that we completely gasify the whole of the coal, including tar. My process differs from any known method of carbonizing coal or water-gas practice. His thermal balance-sheet, if relative to my plant, is very far astray, inasmuch as both the gas produced and the blow gases leave the generator at a considerably lower temperature than is mentioned by him. I know the thermal balance of my plant, and the chemical reactions taking place within it, from actual tests.

Thermal balances are, however, very delusive. For instance, in one of our standard works, on the credit side of a thermal efficiency balance-sheet, one finds 8 lbs. of retort carbon and 8 lbs. of sulphur. Then we get comparative costs of gas making:

Coal gas, horizontals	3'01d. per therm.
Vertical retorts, 30 p.ct. steaming .	2'43d. ,,
Blue water gas	4'0d. ,,
,, ,, self-steaming . . .	3'0d. ,,
Complete gasification	2'90d. ,,

These estimates take no account of interest on capital cost of plants and stocks, depreciation, repairs and maintenance, labour, and stand-by charges; and when all these items are considered, even blue water gas may be cheap at 4d.

I have much more faith in bank balances than thermal balances; and to be of any use, they want chasing into the banking account. These are the kind of results I like to hear of. One manager writes: "Thanks to your plant, my profits are £1000 more than last year; and my Directors gave me a present of £100." Another writes: "Please quote us for a duplicate plant of 500,000 c.ft. per day. We were able to clear the cost of the present one out of revenue." And another: "We don't mind spending money on your plant. We saved the cost of it in nine months." A manager of a small works writes: "Notwithstanding the coal strike, my profit is over £1000, against £800 last year." Another: "Thanks to your plant, I am able to give my shareholders 10 p.ct. dividend this year."

Thermal balance-sheets are all very well in conjunction with the £ *s. d.* balance-sheet. That's the one that counts every time. For instance, take the various low-temperature carbonizing processes. They have been plastered-up with thermal-balances of every kind, painted with "dyes" of every shade of the rainbow, and varnished with every kind of spirits and cordials, but have never made any brass.

I am obliged to Mr. Marshall for his friendly criticism, and hope shortly to produce for him, not a rabbit, but a hare. C. B. TULLY.

Carlton-on-Trent, Newark, Feb. 11, 1922.

SIR,—There is some indication of arm-chairs, crossed legs, cigarettes, and coffee when one's attention has to be drawn to something which is supposed to need criticism. That a serious regard for difference should be a fitting acknowledgment for yeoman service rendered during a time of great crisis is as big an abnormity as any fifth leg—generally a low-temperature member, which no amount of wraps would keep warm. The quotation of figures without giving the basic multipliers they are produced from is a move in the direction of hitting below the belt.

One statement to which objection is taken is that Mr. Tully's gas heat values are "422 and 412" B.Th.U.—an average of 417 B.Th.U. Against this average, a "net useful value" of 390 B.Th.U. is given; but the critic leaves us, the readers, to guess how the 390 is arrived at.

The following multipliers are averages of many years' collections of calorific values—observed and calculated—often found within 1 p.ct. difference between each other.

Mr. Tully's gas:

CO . .	39'2 p.ct.	×	323	= 12661'6
C_nH_m . .	1'5 ,,	×	2329	= 3493'5
CH_4 . .	12'2 ,,	×	1005	= 12261'0
H_2 . . .	41'0 ,,	×	320	= 13120'0
				415 B.Th.U.

Mr. Tully's gas—average, 417 B.Th.U.

It is too good information for the critic simply to declare that a high-temperature retort yielding an average of 12,500 c.ft. per ton carries a 36 p.ct. methane content, without at the same time giving the hydrocarbon content, which must be in the locality of 5 p.ct.

Where an assumed figure for the thermal heat value of the coal is taken as a base for criticism, the succeeding thermal heat balances one can raise his hat to, and say "Good-bye" to the "Fifth Leg."

327, *Roundhay Road, Leeds, Feb.* 11, 1922. THOS. SETTLE.

The Weak Spot of the Industry.

SIR,—The publication of the letter under the heading "The Weak Spot of the Industry," from the President of the "N.A.T.G.O.," has been warmly welcomed as most opportune. As a member of the Executive Committee of this organization, I can assure the profession generally that the silence we have had to observe with regard to the recent activities of this vigorous body has been most irksome to the Committee. We have had to bear a continual fire of criticism and questioning, and have been unable, because of negotiations in progress, to come out into the open to justify, and claim credit for, the great amount of good work that has been done.

Now, however, the position is this: The "N.A.T.G.O." has prepared its case for the advancement of the technical gas official; and, in response to its request to be heard on behalf of the profession by the Federation of Gas Employers of the National Gas Council, through a deputation, an answer has been received in the blank negative. The workmen can be met, but not the officials. The electrical engineers can have their Joint Staff Whitley Committee, and be placed in an infinitely better condition in their industry than their colleagues in the more arduous and intricate profession of gas engineering. It is not a good augury for the future success of the gas profession, when the powers that be refuse to grant the same consideration as that enjoyed by the electrical profession. Surely this attitude cannot persist.

I might mention a few of the arguments used by opponents of the "N.A.T.G.O." First, we have those who object to any organization at all. "We prefer to deal with our officials as we think fit." "We object to anything remotely resembling a trade union." These people, of course, will have to wake up before long, and learn that collective bargaining and dealing has come to stay. The "B.C.G.A.," the National Gas Council, the Federation of Gas Employers, &c., are some indication of how far the industry has progressed along this path. No other industry is so splendidly served in this regard. Secondly, we have members of the profession who object to a scale of salaries. "Pay a man what he is worth," they say. We agree (the "N.A.T.G.O."), and point out that what we are up-against is the paying of men a good deal less than what they are worth; and the only way—the only possible way—is by a scale of minimum salaries (such as we have drawn up) as a guide to those who are willing to pay a fair salary, and want to know what is a fair salary. I am pleased to state that the "N.A.T.G.O." scale has been of great use to many already, on both sides.

We were, and still are, most urgently desirous of discussing the scale of salaries with representatives of the employers, when the whole question of the basis and calculation of it would be open for discussion and amendment, if thought proper. It must not be overlooked that the whole question of status depends in the first instance on recognition by the payment of adequate salaries. While due weight must be paid to attracting suitable entrants to the profession, it cannot be denied that the past most trying period in the history of the industry has proved the solid worth of the present occupants of the responsible positions in the industry; and we claim that better reward for their services will be followed by the happiest results, in the great evolution in gas supply now in progress.

Now, Sir, this "N.A.T.G.O." has had to work through very troubled times; but I claim for the present Executive Committee that, under their guidance, the Association has made, and will continue to make, marked progress. We are determined that we shall secure for the gas profession every advantage in regard to pay and conditions of service that has been, or will be, secured by the rival industry electricity. We feel that the pride that our employers have in our great industry will help. Surely they will not deny their officers the recognition given by their rivals to their officers.

We have many friends, and a cause vital to the welfare of the gas industry; and with the profession solidly behind us, and an Executive determined to succeed, I feel it will not be long before better counsels prevail in the Federation of Gas Employers and the National Gas Council, and our case for recognition be heard and granted.

Gas-Works, Buxton, Feb. 9, 1922. F. G. SHAW.

Sale and the Stretford Gas Question.—A deputation of ratepayers waited upon the Sale District Council in consequence of the vote on the gas question in Sale having gone against the formation of a local Gas Board to acquire from Manchester the Stretford gas undertaking. The Council suggested that they should forthwith take steps to oppose the Bill in Parliament, and decided to send a deputation to London to ascertain their legal position in the matter.

South Staffordshire Mond Gas Company.—The annual meeting of the South Staffordshire Mond Gas (Power and Heating) Company will be held at Dudley Port, on the 28th inst. The Directors, in their report, state that, owing to trade depression, the disastrous effects of the coal strike, and the continued fall in the price of residuals, there was a serious loss on the year's working. It became evident during the coal strike that the Company would lose considerably; and on June 30 the Directors advised the shareholders that it was impossible to carry out the resolutions passed at the last annual meeting, providing for the payment of further dividends to the preference and ordinary shareholders on July 1. As most of the works supplied by the Company are on short time, and some are closed-down temporarily, there is no prospect of the Company being able to carry out the resolutions during the current year; and the Board will propose at the annual meeting that the resolutions be cancelled. The Directors also express regret that the payment of the dividend on the preference shares for the past year will have to be deferred. The loss on revenue account was £22,743.

REGISTER OF PATENTS.

Purification of Gas.—No. 167,185.

KLÄRDING, N., of Kolscheid, Germany.

No. 20,317; July 28, 1921. Convention date, July 28, 1920.

It has been suggested previously, the patentee says, to separate tar fog and other finely divided impurities from combustible gas by subjecting the gas to the action of a stream of particles of water, shot, or metal dust electrostatically charged; but the removal of the dust from plate-like electrodes without causing disturbances leads to difficulties. According to the present invention these difficulties are said to be obviated, in that the dust particles are deposited by high-tension electricity on irregular superposed iron rings, which form the filtering material. This can be arranged in different chambers which can be disconnected and used alternately. Preferably the filtering material is moved slowly in a closed column, while the gas stream is passed transversely through it.

The invention includes apparatus designed for the removal of the deposited dust by agitation of the filtering material by electro-magnets; the whole being explained in conjunction with a drawing, which is not reproduced.

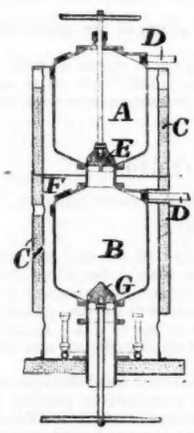
Carbonization and Distillation of Carbonaceous Material.—No. 173,099.

CHOWN, J. A., of Pall Mall, London.

No. 28,676; Oct. 9, 1920.

This invention relates to the carbonization and distillation of cannel coal, torbanite, and other carbonaceous material, and has for its object to devise means whereby the operations in question may be carried out simultaneously by a continuous method—thus greatly increasing the output as compared with existing discontinuous or intermittent methods.

The material to be treated is subjected to two separate operations, the first of which includes pre-soaking and pre-heating in the presence of a liquid hydrocarbon at a comparatively low temperature, whereby the more volatile compounds may be distilled off and collected; and the second of which consists in a distilling operation during which the material already treated by the first operation is carbonized and the less volatile compounds collected.



Chown's Apparatus.

In the illustration, A B are two chambers, the lower of which may be used as a retort, while the upper one is used for steeping the material in a suitable hydrocarbon oil prior to being distilled. The two chambers are arranged in a suitable setting C, and are both adapted to be heated by means of producer or other suitable gas. Each chamber has a suitable connection D to a condenser for the removal of volatile compounds, and communicates with the other by means of a valve (which may be opened or closed mechanically, by hand, or otherwise).

The lower chamber may have a lateral extension F by means of which any substances that it may be desired to mix with the material passed from the upper chamber may be introduced. It is also furnished at its lower portion with a valve G (which may be opened or closed by the means opening or closing the first-mentioned trap or by independent means), through which the material passes to briquetting apparatus (not shown) or elsewhere. If desired, the lower chamber may be fitted with scrapers fitted to the valve and operated by rotating the valve, so as to prevent excessive coking.

In operation the material, ground into small pieces, is steeped in any suitable liquid hydrocarbon in the chamber A, and at the same time is subjected to the action of heat, the whole mixture being kept thoroughly stirred and agitated. When the lower chamber has been raised to a sufficient temperature to carbonize the material, the valve is opened, and a fresh quantity of material is fed into the chamber A.

Manufacture of Gas and Coke.—No. 157,219.

GEWERKSCHAFT VER CONSTANTIN DER GROSSE, of Bochum, Germany.

No. 1093; Jan. 8, 1921. Convention date, May 7, 1919.

The patentees say it has been proposed to charge distilling ovens for gas and coke manufacture with coal piled loosely on flat or box-shaped trucks or conveyors moved through the oven in such a manner that the coke can be taken out continuously at one end. In the manufacture of briquettes, it has been proposed first to mould the mixture of fuel and binding material into blocks of briquette size, and then to pass the latter, piled on trays, through a distilling oven. They have found that if the coal is moulded into the shape of a large block and placed on a truck with its sides and top exposed, the block will retain its shape when passed on the truck through the oven, so that at the delivery end a block of coke can be taken from the truck. This is a very convenient method of working.

The oven comprises a number of cells side by side heated in the known manner by flues between them. The material to be coked is stamped into blocks; and each block is discharged into a truck, which is run into the oven, pushing the truck and block which precede it. Thus in regular sequence a block is pushed out on the coke side each time one is inserted on the charging side. To avoid friction the blocks are somewhat narrower than the interior of the cells; and tests have shown that the block does not materially change in shape during the coking process, so that the whole series can be pushed through freely. Preferably the oven doors are connected to mechanism for lifting and lowering the trucks so that one door (on the charging side) is lifted when a truck is lowered, and the other door (on the coke side) is lowered when a truck is lifted.

The heating of the cells is so carried out that the coke is nearly cool by the time it reaches the discharging side, and need not be quenched. For this purpose the heating zone is set-back considerably from the coke side, by a suitable arrangement of the gas and air ducts.

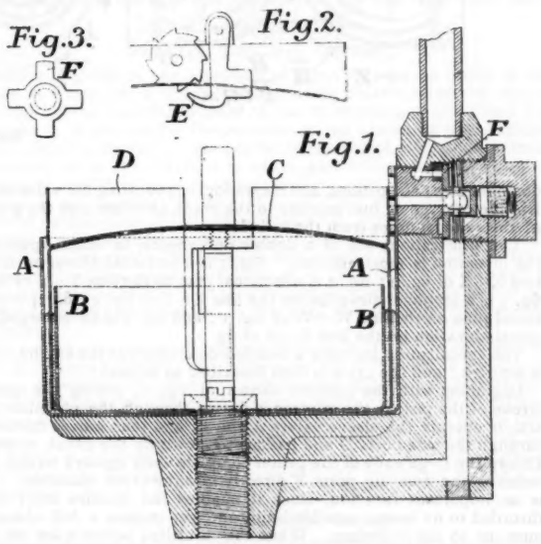
Gas-Controlling Apparatus.—No. 173,566.

ANDERSON, J., of Edinburgh.

No. 25,234; Sept. 1, 1920.

This invention relates more particularly to apparatus for the automatic lighting and extinguishing of gas-burners—for example, main and pilot jets for low-pressure systems. Many different forms of apparatus have been proposed for this purpose, utilizing a bell raised when desired by temporary increases of pressure. But all, the patentee says, have certain elements complicating them; and the object of the present invention is to provide a modified apparatus in which the major part of the working mechanism is disposed external to the operating bell. By this means cleaning, adjustment, and inspection are facilitated, obviating the use of rubber seatings and providing a simple and practically frictionless connection between the operating bell and the ratchet and pawl operating the valve, while at the same time simplifying commercial manufacture.

A further object is to provide in combination with the apparatus means for ensuring approximately vertical travel of the bell without canting or binding (as described in patent No. 6754 of 1909) and a rotary valve as described in patent No. 14,798 of 1913.



Anderson's Gas-Controller.

Fig. 1 is a longitudinal section of the controller; fig. 2 is a detail taken at right angles thereto of the ratchet and pawl mechanism; and fig. 3 illustrates the rotary valve.

On the circular base is mounted a drum A containing a smaller drum B, so that an annular space containing mercury is left between them. Within the inner drum is provided guiding apparatus (on the lines indicated in patent No. 6754 of 1909) of which the fixed part is attached to the two drums and to the circular base by screws. Within the annulus a bell C is provided carrying a tray D for the reception of loading weights, these parts being connected to the moving section of the guide. The tray also carries a weighted pawl E (fig. 2) for the operation of the gas-controlling mechanism.

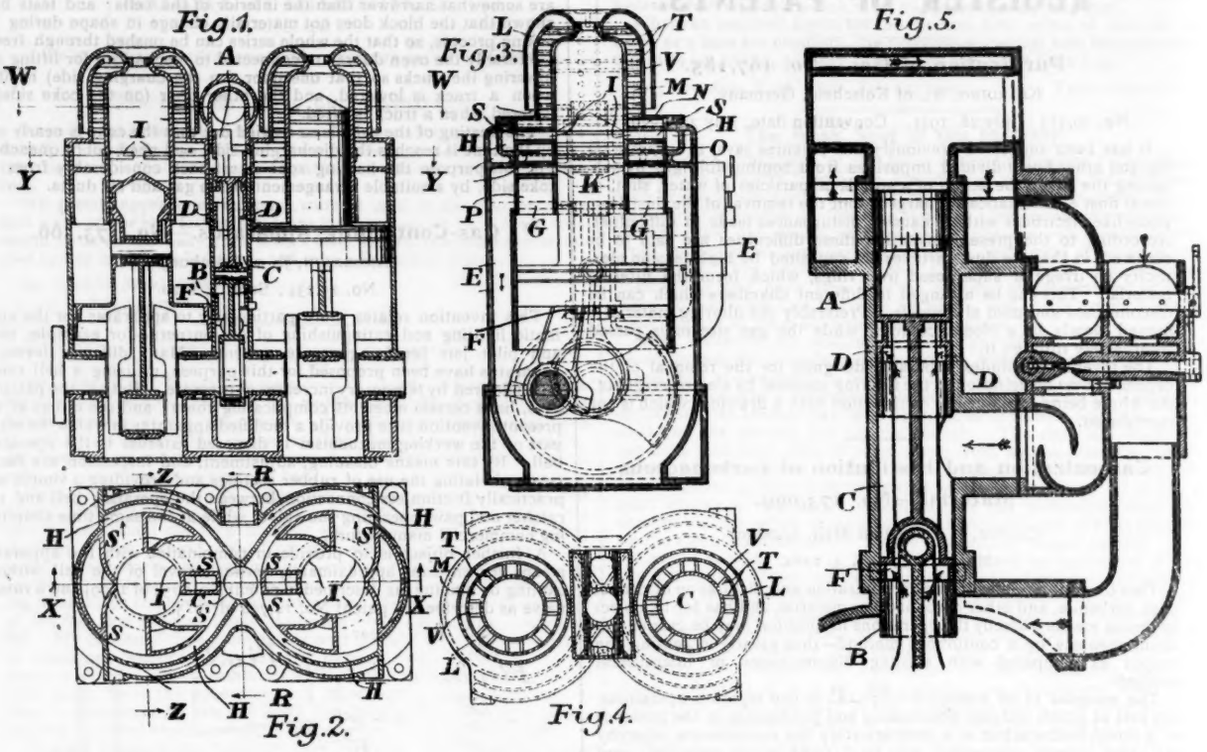
This mechanism comprises a ratchet wheel adapted to be operated by the pawl E and carries a spider F (fig. 3) which for the control of a main and pilot jet has four arms at right angles. It is ground at one face to move over the ground surfaces of two circular ports and a circular guiding ring to control the passage of gas to the burners, which are alternately lighted and extinguished by temporary increases of gas pressure operating the bell. The apparatus is particularly useful in connection with low-pressure systems. The number and arrangement of ports and co-operating spider arms may be varied according to the burners it is desired to control and the sequence in which controls are to be effected.

Gas-Engines.—No. 173,544.

WOOLF, E. J., and J. F., of Minneapolis, U.S.A.

No. 18,580; July 5, 1920.

The object of this invention is to produce a two-cycle engine comprising a casing forming an explosion cylinder and containing a series of exhaust passage-ways communicating with the explosion cylinder and an adjacent cylindrical valve chamber, and also containing a series of inlet passage-ways communicating with the explosion cylinder and the crank chamber, a single valve member dividing the valve



Woolf's Gas-Engine.

chamber into two portions, and means for reciprocating the valve to control the passage of fuel mixture to the crank chamber and the passage of the exhaust gases from the cylinder.

The illustrations are of a double-unit engine, in which application the invention is most efficient. Fig. 1 is a sectional elevation on the line X—X of fig. 2; fig. 2 is a sectional plan on the line Y—Y of fig. 1; fig. 3 is a sectional elevation on the line Z—Z of fig. 2; fig. 4 is a sectional plan on the line W—W of fig. 1; and fig. 5 is an enlarged sectional elevation on the line R—R of fig. 2.

The specification includes a detailed description of the engine, which is omitted; and the cycle is then described as follows:

Beginning with the position shown in fig. 1, during the upward stroke of the pistons the mixture is drawn through the chamber C, in which operate the sleeve valves A and B, and then moves downward through the side ports D and passages E towards the crank chamber. Before the large ends of the piston complete their upward stroke, they uncover the free air ports F directly into the crank chamber. This is an important function, since it enables the mixture itself to be throttled to its lowest possible limit, and yet insures a full charge of pure air to the cylinders. When the throttling action is for the purpose of reducing the speed of the engine, the free air should be throttled coincidently with the gas admission. During the downward or working stroke of the piston, the sleeve valves close the ports D leading to the passages G, and the large ends of the pistons close the free air ports F. Then precompression begins in the crank chamber. This precompression continues until the sleeve valves first uncover the ends of the exhaust passages H, and the piston heads next uncover the inner exhaust ports I. This exhausts the combustion cylinders down to less than charging pressure; and finally continued downward movement of the piston heads uncovers the charging ports K. The precompressed mixture then enters the cylinders. The scavenging air, first sweeping the piston heads and meeting at a common centre, is deflected upwards through the central zone of the combustion cylinders to the centrally located spark plugs, and is re-deflected around and over the wall of the combustion space, then downwards over the cylinder walls towards the exhaust ports. As the sleeve valve closes the exhaust passages leading to the ports I before the piston head closes the charging ports K, the fresh charge will not reach the exhaust ports, and the products of the previous combustion not expelled by the incoming charge will be left immediately surrounding the closed exhaust ports, while the free air following the gas charge into the cylinders is left immediately over the piston head, thus stratifying the gas and air in the combustion cylinders. During the compression stroke within the cylinders, the dead gases and air surrounding the exhaust ports are forced upwards along the wall of the cylinder and the combustion chambers. This interposes a cushion between the walls and the centrally enclosed gas charges, thus preventing excessive radiation.

It will be apparent from the above description that as the piston moves back and forth, it will alternately draw and force-out a large volume of air through the series of passage-ways L, M, N, O, and P. This air will, therefore, travel in immediate proximity and in contact with the outer walls of the cylinders, the outer walls of the exhaust passage-ways S, around the heat-withdrawing pins T, and along both walls of the cylinder V communicating through the pins with the main walls of the explosion cylinder. The result is that the explosion cylinder and the exhaust passage-ways are maintained at a sufficiently reduced temperature to operate without the use of any cooling medium other than the air pumped in and out by the action of the upper portion of the pistons.

The result is a self-contained air-cooled two-cycle motor wherein a single valve controls the operation of two units. All parts are operated directly from the crank-shaft and in conjunction with the engine piston.

Bunsen Burners.—No. 173,593.

BOWDEN WIRE, LTD., and DAVIES, P., of Willesden Junction.

No. 27,794; Sept. 30, 1920.

To obtain complete combustion of a mixture of air and gas, the theoretical proportion of the air to the gas should be about five volumes to one; but under existing conditions of low-pressure gas supply, it is generally impossible to obtain a mixture of gas and primary air containing more than three volumes of air to one of gas. In consequence of this low proportion of air, the mixture is inefficient and the combustion of the gas incomplete.

In an endeavour to overcome the above-mentioned disadvantages, in connection with bunsen burners it has been proposed to provide a burner for gas-rings, gas-fires, and other apparatus in which the flame of gas and primary air issuing from the aperture is spread-out to a thin film by direct contact with the kettle or other article being heated—a natural consequence of such spreading being that the flame absorbs additional or secondary air from the atmosphere. According to the present invention, the burner is provided with one or more baffle-plates or other flat surfaces (as distinct from the vessel or article being heated), which is or are so disposed, and at such a distance relatively to the orifice of the burner, that the flame of gas and primary air is spread out into a thin film; the latter being of such an area that it will absorb sufficient secondary air from the atmosphere, and beyond the point of combustion of the gas and primary air, to produce complete combustion of the gas.

Atmospheric Burners and Fuel.—No. 173,892.

AIRD, K., and WORTLEY, G. W., of Falkirk.

No. 28,911; Oct. 12, 1920.

The object of the patentees is to construct a gas-fire burner with a slit or slits running the full length of the burner, or divided into a number of slits in line with spacings between for the purpose of accommodating the fuel. This may be in one solid block or in sections equivalent to three or four pieces of the ordinary upright gas-fire fuel as at present used.

By the use of this slit burner in conjunction with a solid block or blocks of fuel the following advantages are claimed:

1. A broad sheet (or sheets) of flame is supplied extending the whole width of the fire, which gives the fire an even appearance.

2. The use of a sheet flame ensures more surface area of flame to come in contact with the fuel, thus increasing the intensity of the temperature obtained.

3. The ordinary difficulties of locating and supporting from six to eleven separate pieces of fuel are obviated; and it is possible greatly to facilitate manufacture on this account.

PARLIAMENTARY INTELLIGENCE.

On Tuesday of last week, His Majesty the King opened the fifth session of the thirty-first Parliament of the United Kingdom.

HOUSE OF LORDS.

The following Bills were presented and read the first time: Bolton Corporation, Doncaster Corporation, Ramsgate Corporation, Stoke-on-Trent Corporation (Gas Consolidation), Stretford and District Gas Board.

The Standing Orders applicable to the following Bills have been complied with: Birmingham Corporation, Bolton Corporation, Blackburn Corporation, Doncaster Corporation, Neath Corporation, Ramsgate Corporation, Sheffield Gas Company, Stretford and District Gas Board, Stoke-on-Trent Corporation (Gas Consolidation), Windsor Gas Company.

The Standing Orders have not been complied with in regard to the following Bill: Blackburn Corporation.

HOUSE OF COMMONS.

Bills to Originate in the House of Lords.

The following Bills will originate in the House of Lords: Bolton Corporation, Doncaster Corporation, Ramsgate Corporation, Stoke-on-Trent Corporation (Gas Consolidation), Stretford and District Gas Board.

The following Bills have been presented, and read the first time: Birmingham Corporation, Neath Corporation, Sheffield Gas, Windsor Gas.

Petitions Against Bills.

Petitions have been deposited against the Neath Corporation Bill, by the Neath Rural District Council, National Oil Refineries, Port Talbot Corporation, Swansea Corporation, and the Glamorgan County Council; Windsor Gas Bill, by the London and South Western Railway Company; Birmingham Corporation Bill, by the Birmingham and District Property Owners' Association, the London and North Western Railway Company, and the Great Western Railway Company; Blackburn Corporation Bill, by the Lancashire Electric Power Company, Lancashire County Council, and the Rishton Urban District Council; Sheffield Gas Bill, by the Sheffield Corporation.

The South Shields Gas Company have presented a petition against the Jarrow Extension and Improvement Bill.

Domestic Gas to have a "Pungent Smell."

A copy was presented of a draft of a Special Order proposed to be made by the Board of Trade under section 2, sub-section (4), of the Gas Regulation Act, 1920, providing that gas containing carbon monoxide shall have a pungent smell when supplied for domestic purposes. It was resolved that the Order be approved.

Public Utility Companies (Capital Issues) Act, 1920.

Copies of reports were presented by the Board of Trade on applications by the following gas companies: Arundel, Brodsworth and District, Conisbrough, Felixstowe, Gorleston and Southtown, Haywards Heath District, Hightown, Keswick, Langley Mill and Heanor, Launceston, Littlehampton, Lowestoft, Northampton, Prescot, Preston, Ryde, Shorley Bridge and Consett, South Bank and Normandy, Swanage, United District, Woolton, Wrexham.

Scientific Apparatus and Taxation.

Mr. BRIANT asked the President of the Board of Trade whether any complaints that scientific apparatus essential for research work were difficult to obtain, owing to the operation of the Safeguarding of Industries Act, had reached his Department.

Mr. BALDWIN replied that no complaints of the kind indicated had been made to his Department; but he understood that certain complaints had been received by the Department of Scientific and Industrial Research, and that their validity was being investigated.

Newcastle Gas Company's Order.

Mr. STANLEY BALDWIN, the President of the Board of Trade, in reply to questions by Major BARNES, said the Board received an application from the Newcastle-on-Tyne and Gateshead Gas Company on Feb. 12, 1921, for an Order under section 1 of the Gas Regulation Act, 1920, and an order was made on April 27. The provisions of sub section 6 were duly complied with by advertisement of the application in the "London Gazette," and in a local newspaper, and by service of notice upon the local authorities. Representations were received from the Newcastle-on-Tyne, Gateshead and Wallsend Corporations, the Felling-on-Tyne, Whickham, Newburn, Gosforth and Longbenton Urban District Councils, and from the North Eastern Railway Company. An inquiry was held at the Board of Trade on March 30 by the Director of Gas Administration, at which the Newcastle and Gateshead Corporations and the Whickham Urban District Council appeared, and were heard in support of their objections.

Carbon Monoxide Questions.

Sir W. DAVISON asked the Prime Minister whether his attention had been called to the statement made by the Liverpool Coroner on Feb. 3 at the conclusion of an inquest on the bodies of four members of a family named Craig, who were found to have died from poisoning by carbon monoxide due to a defect in the gas fittings of their bedroom, to the effect that so long as this poisonous substance was allowed to remain in the supply of gas for illuminating and heating purposes it was dangerous for anyone to have a gas-fire in his bedroom; and whether he would introduce such legislation as might be necessary to protect the public from this serious though avoidable risk?

Mr. BALDWIN, who replied, said he was aware of the case referred to, but had not seen any report of the proceedings which contained the statement mentioned. The draft of a Special Order proposed to be made by the Board of Trade, the effect of which was to prohibit the supply of any gas containing carbon monoxide unless it had a distinctive pungent smell, had been already approved by a resolution of the House, and the Order would be made as soon as the necessary resolution had been passed in another place.

Sir H. NORMAN asked the Home Secretary if there was any limit to the percentage of carbon monoxide in gas supplied for domestic use; if his department was kept informed of the actual percentage in gas supplied; and, if so, would he state what it was in typical cases.

Mr. BALDWIN, who replied, said that there was no statutory limitation of the proportion of carbon monoxide in gas supplied for domestic purposes. Information was obtained from time to time by the Board of Trade from which it was possible to estimate the proportion of carbon monoxide in the gas. There were very few cases in which it would appear that the proportion would exceed 20 p.ct., and, generally speaking, the proportion was considerably below this figure.

Imported Gas-Mantles and Taxation.

Mr. KILEY asked the President of the Board of Trade the reason for the delay in putting into operation the decision of the Referee under the Safeguarding of Industries Act regarding the imposition of a duty of 33⅓ p.ct. on gas-mantles which contained certain commodities which were liable for duty.

Mr. BALDWIN, in reply, said the Referee had not yet made his award in respect of gas-mantles, and consequently there had been no occasion for the Board to take any action.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" of applications to the Board of Trade under the Gas Regulation Act.

SPECIAL ORDERS.

Gas Light and Coke Company.

Notice is given of the intention of the Company to apply to the Board of Trade for a Special Order, under section 10 of the Act, to provide for the transfer to them of the undertaking of the Ilford Gas Company; to provide for the payment to the Directors and Auditors of the Ilford Company of compensation for loss of office, and to make provisions as to the taking-over of, or payment of compensation to, officers of the Ilford Company by the Gas Light and Coke Company, and as to the payment by the Gas Light and Coke Company of pensions to persons now or formerly employed by the Ilford Company; to provide for the transfer to the special purposes fund of the Gas Light and Coke Company of the reserve and insurance funds of the Ilford Company; and to make provisions as to the price to be charged by the Gas Light and Coke Company for gas supplied, and the hire of prepayment meters and fittings, in the area now supplied by the Ilford Company.

There are also clauses to regulate the supply of gas; to authorize the laying of pipes through parts of premises for the supply of gas to other parts; to enable the Company to specify the size and materials of pipes and fittings and the placing of meters; to require the use of valves in connection with high-pressure air; to enlarge the powers of the Company of acquiring lands by agreement; to increase the maximum contributions to the special purposes fund and the maximum remuneration payable to the Directors; and to amend the provisions in the Company's 1909 Act with reference to the co-partnership scheme.

Shrewsbury Gas Light Company.

Notice is given by the Company of an application for a Special Order to increase their borrowing powers, and to make other financial provisions, including removal of limits of dividend on preference capital; to regulate the supply of gas; to make provisions for a special purposes fund and a reserve fund; and to provide for the issue of stock to co-partners, and for the payment of pension and other allowances to officers and servants.

DECLARATION OF CALORIFIC POWER.

Worksop Gas Company.—470 B.Th.U. (Feb. 15.)

GAS REGULATION ACT ORDERS.

We have received from the Director of Gas Administration copies of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Banbury Gas Light and Coke Company.

As from the declared date, the maximum price in respect of gas supplied by the undertakers shall be 16 8d and 19 2d. per therm; and these prices respectively shall be substituted for the prices of 4s. 6d. and 7s. per 1000 c.ft. mentioned in section 53 (limiting price of gas) of the Banbury Gas Act, 1866.

As from the declared date, the price of 14 4d. per therm shall be substituted for the price of 3s. 6d. per 1000 c.ft. mentioned in section 53 of the Banbury Gas Act, 1866. (Feb. 6.)

Stourport Gas Company.

After the declared date, the standard prices in respect of gas supplied by the undertakers shall be 16d. and 17·2d. per therm; and these prices respectively shall be substituted for the prices of 4s. 6d. and 5s. per 1000 c.ft. wherever they occur in section 59 (sliding-scale) of the Stourport Gas Act, 1919.

For the purpose of ascertaining the authorized rate of such dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-two-thirds. (Feb. 7.)

THE GAS LIGHT AND COKE COMPANY.

Cheaper Gas. The Turn of the Tide. No Grounds for Alarm as to Danger from Gas.

The Two Hundred and Fifteenth Ordinary General Meeting of Proprietors was held last Friday, at the Chief Office, Horseferry Road, Westminster, Mr. D. MILNE WATSON (the Governor) in the chair.

The SECRETARY (Mr. W. L. Galbraith) read the notice convening the meeting; and the seal of the Company was affixed to the "Register of Proprietors." The report and accounts were taken as read.

THE GOVERNOR'S ADDRESS.

The GOVERNOR: Ladies and Gentlemen,—Before I deal with the accounts, I wish to refer to the loss which the Board have sustained in the past year by the death of two Directors.

CHANGES IN THE BOARD.

Mr. Miles had been associated with the Company since 1898, during which time he acted as Deputy-Governor for three years, then as Governor for two years in succession to the late Sir Corbet Woodall. In 1918 he resigned the Governorship, owing to failing health, but remained a Director until the time of his death. Mr. Waterlow had been a Director since 1906, and acted as Deputy-Governor for six years. These two gentlemen were most able Directors; and their extensive knowledge of business affairs was of great value to the Board. They were both most pleasant colleagues to work with. They are very much missed; and their loss is deeply regretted. The vacancies thus caused were filled by the appointment of the Hon. Clive Bigham, whose acquaintance with public affairs will be of much service to the Board; and of Mr. Goulden, who has been Chief Engineer since 1904, and whose great knowledge of the Company's business will be most useful.

AN ANXIOUS AND EXTRAORDINARY YEAR.

The year that has just closed has been one of the most anxious and extraordinary in the annals of the Company. As I told you at our meeting in February last, owing to the unprecedented slump in residuals, the Company found themselves in a position of difficulty; and I explained to you at the time why an advance in the price of gas had become absolutely necessary. We knew then that a bad time awaited us; but it was not long before our troubles were still further accentuated by the stoppage in the coal mining industry, which occurred at the beginning of April, and lasted until the end of June. Fortunately, at the beginning of the stoppage we had good stocks of coal and oil; but after two months our stock of coal became exhausted, and we were, therefore, forced to purchase large quantities of Continental and American coal in order to keep going. The Directors determined that, so long as coal could be obtained, whatever the price might be, it was their clear duty to keep London supplied with gas without any diminution of quality or pressure ["Hear, hear"]; and it is with a considerable amount of pride that we are able to record the fact that the Company continued to supply gas throughout the whole period without any interruption whatsoever.

THE COST OF THE COAL DISPUTE.

The cost to the Company of doing their duty was, however, very serious. We not only had to pay a high price for the foreign coal, but, owing to its inferior quality, we had to bear the additional expense of purchasing almost a double quantity. The result was we lost nearly £500,000, without reckoning the loss of business which was a direct consequence of the restrictions placed upon the consumption of gas. The after-effects of the coal dispute, moreover, were almost as bad as the dispute itself; and the trade of the country was so dislocated that for a long time afterwards we suffered from serious decreases in consumption. Fortunately, however, some financial relief came with a gradual fall in the prices of coal and oil; and this enabled the Company to end the year without such a heavy loss as was at one time anticipated. You will see that the Company have spent a considerable sum of money on the capital account—namely, £315,000. Of this, £185,000 was spent upon new mains, meters, and stoves—business-getting and revenue-earning expenditure—and the balance of £130,000 was spent mainly upon the completion of the payments for the Company's fleet of steamers.

A STRONG FINANCIAL POSITION.

When it is considered that we have passed through the greatest coal dispute that has ever afflicted this country, the result of the year's working, as shown in the revenue account, is one of which the Company have no reason to be ashamed, and is good evidence of their strong financial position generally. Under the altogether abnormal circumstances which have attended our working during the year, comparative detailed figures are of small value. You will see, however, that we paid less for coal. This is partly due to the fact that we used less coal—1,800,000 tons, instead of 2,279,000 tons—and also to the fact that during the second half of the year the price of coal dropped considerably. The figure for oil has more than doubled, due to the larger quantity used—especially during the period of the coal stoppage. The sale of gas during last year shows a decrease of 5 p.ct. While this is much to be regretted, it is not a matter to be wondered at, and is due to three principal causes—first of all, the coal stoppage and the necessity for strict economy in the consumption of gas; secondly, the depressed state of trade during the whole of the year, accentuated as it was by the coal dispute; and, thirdly, the extraordinary weather which we experienced during 1921.

FALLING REVENUE FROM RESIDUAL PRODUCTS.

The outstanding adverse feature of the accounts is the falling off in the revenue from the Company's bye-products. The revenue from these has fallen from £4,839,000 to £2,498,000, a decrease of £2,341,000 in the year; and had it not been for the exercise of the greatest care in every direction, the results would have been less satisfactory. This decrease in the revenue from residuals was anticipated by me at our last meeting; and this anticipation has unfortunately come true.

NO CAUSE FOR PESSIMISM.

There is no occasion, however, for pessimism. There is no doubt in my mind that, as far as the Company's business is concerned, we have turned the corner, and that we, as a Company, have seen the worst. The prices of our principal raw materials—coal and oil—have, as I have already pointed out, fallen considerably; and we have, I am glad to say, come to an arrangement with the principal Unions concerned by which the wages of our employees are regulated on a sliding-scale on the basis of the cost of living. As you are probably aware, the Company had to give up the hiring-out of stoves during the war, owing to the large capital cost involved. We have, however, resumed our usual practice; and I am happy to say that the result has been most satisfactory, leading to a very great demand for gas apparatus of all kinds.

REDUCTION IN THE PRICE OF GAS.

Towards the end of the year, the general position of the Company was such that the Directors felt justified in announcing a reduction in the price of gas to 1s. 1d. per therm as from the taking of the meter indices at Christmas. This will mean a saving to the consumers of £600,000 a year. The announcement of this reduction in price, together with the resumption of hiring facilities, has produced an increased demand for gas, which is most encouraging. The prospects of the Company are, I consider, excellent. The increase of 4981 in the number of consumers shows that the basis of our business is ever growing; and the increase of 39,065 in gas-stoves sold and let on hire indicates that there undoubtedly is, among the existing consumers, a large field in which to extend our business. The internal position of the Company is also very satisfactory. We have now a large fleet of steamers carrying coal from the North, which is a continuing source of economy to the Company. The works, I am glad to say, are being rapidly brought back to the pre-war standard of efficiency; and the Company generally are in a healthy position, and eagerly awaiting a revival in trade.

THE NEED FOR NATIONAL ECONOMY.

Many chairmen have recently, when dealing with the affairs of their companies, pointed out the necessity for national economy in expenditure, in order to relieve the burden of taxation upon industry; and I should like to add my appeal to the Government upon this subject. It used to be the pride of this country that it was one of the least taxed. To-day our taxes are among the highest; and if ever this country is to regain its prosperity, it is absolutely essential that there should be a great reduction in the national expenditure.

It is proposed now that Public Utility Companies should in future be subject to the Corporation Tax; and I desire to protest in the strongest possible way against this proposal, as putting an additional burden on the gas consumers.

THE ALLEGED INCREASED DANGER OF GAS.

I dare say you have noticed that there has been a great deal of prominence given in the Press recently to the composition and quality of the gas supplied in this country generally; and a suggestion has been made that the gas now being supplied is a danger to the public. Ladies and gentlemen, there is absolutely no ground for this suggestion. Not only in the interests of the shareholders in gas undertakings throughout the country, but also for the purpose of restoring the confidence of any consumers of gas who may possibly be alarmed by the comments which have appeared in the Press, I feel it my duty to place on record the true position.

AN INDEPENDENT INQUIRY.

Gas undertakings have never been under any restrictions with regard to the proportion of carbon monoxide which the gas supplied should contain; and as recently as six months ago the question was reviewed in all its bearings by a Committee appointed by the Board of Trade, under the Chairmanship of such a well-known man as Sir William Pearce, who is a Member of Parliament. [Mr. H. E. JONES: And a business man.] And a man who has always taken an impartial view of affairs connected with public supplies. As a result of a thorough and careful hearing and consideration of full evidence, both for and against restriction, this Committee—composed as it was of responsible and independent scientific men—decided that it was neither necessary nor desirable to impose any restriction on the gas industry in respect of the percentage of carbon monoxide in the gas supplied. Unfortunately, many statements which have appeared in the Press recently have been incorrect; and I would like to draw attention to the following facts which can be established beyond all doubt:

NO CHANGE IN MANUFACTURE.

1.—This Company have been supplying a mixture of coal gas and carburetted water gas for many years past, and, indeed, were the first gas undertaking in this country to do so. No change in our methods of manufacture has been made since the passing of the Gas Regulation Act; and all suggestions to the contrary, and all fears based on these suggestions, are absolutely unfounded.

2.—The percentage of carbon monoxide in the gas now being supplied by the Company is practically the same as was supplied in 1914, and previously; and it is quite untrue to say that the recent accidents have been due to any alteration in the composition of gas.

CARBON MONOXIDE IN AMERICA.

In this connection, you will be interested to hear that throughout the United States of America carburetted water gas alone, without any admixture of coal gas, is very largely distributed. In Washington, the capital and seat of the Government, and one of the principal residential cities, carburetted water gas alone has been distributed for many years past; and in an official memorandum from the Bureau of the Public Health Service of the U.S.A., it is expressly stated that the

presence of carbon monoxide up to 30 p.ct. is not considered to be prejudicial. The most recent analysis of the gas distributed in Washington showed the presence of 28·7 p.ct. of carbon monoxide, which is approximately double the percentage distributed in this Company's area. I have never heard that in the United States the authorities were lax in their guarding of the public interest in these matters.

3.—The accidents due to the escape of gas are lower now in proportion to the number of users of gas than they have ever been before. I would like to draw your attention to the following facts:

Fatalities due to gas do not exceed 2 per annum per million of the population.
Fatalities due to railways are 22 per annum per million of the population.
Fatalities due to street accidents in London are 100 per annum per million of the population of that city.

I think you will agree that these figures alone show very clearly that there is no possible cause for alarm. After that, how can it be argued that the gas undertakings are supplying anything that ought not to be supplied?

NO ODOURLESS GAS SUPPLIED.

4.—It has been suggested that many accidents are caused by reason of the gas supplied being odourless. This is absolutely incorrect. It is true that pure carbon monoxide may be odourless in itself; but pure carbon monoxide is not, and could not possibly be, supplied by gas undertakings by itself, as it is mixed with several times its volume of other gas of considerable pungency, from which it cannot be separated in the process of distribution. It is inconceivable, therefore, that an escape of gas, with its unmistakable smell, could avoid detection. Any suggestion to the contrary is absurd; but it is one that has been repeatedly made in recent letters and statements on the subject.

NO CAUSE FOR ALARM.

Speaking as I do with a full sense of my responsibility as Governor of the largest Gas Company in this country, I assert with the utmost confidence that there is nothing in the composition of the gas now being supplied which need give the slightest cause for fear. ["Hear, hear."] There is one other matter of public interest to which I should like to refer, and that is the attitude of the gas industry to what is called low-temperature carbonization.

LOW-TEMPERATURE CARBONIZATION.

To those who are not familiar with the subject, I should like to say that gas undertakings generally now produce gas by what is known as high-temperature carbonization—that is, by carbonizing coal at a temperature of 2000° to 2200° Fahr., as against a temperature of 1000° Fahr. used in low-temperature carbonization. Gas undertakings are constantly being attacked because they do not carbonize coal at a low temperature; and it is assumed by the advocates of the latter method that gas undertakings are antagonistic to low-temperature carbonization. Nothing is further from the fact. The gas industry as a whole is not antagonistic to any particular method of production of gas; and I can safely say that there is no prejudice against low-temperature carbonization as such. It is, no doubt, an excellent method of obtaining an increased production of liquid bye-products; and I can well believe that in some cases it might be useful in dealing with coal at the pit-heads, where there are large quantities of shale and small coal available. The public are led to believe that the reason why gas undertakings do not adopt low-temperature carbonization is because they are unduly conservative. I think it would be well if I gave a few reasons why we do not adopt this method. The principal reason is that it is not an economical gas-making proposition, but a process that has for its objects, first, the production of increased quantities of tar oils and free-burning coke; gas being the residual of manufacture. This is essentially different from our own process, which is for the purpose of obtaining the maximum quantity of gas from the coal. The high-temperature process produces 70 therms per ton of coal, while the low-temperature production of therms is rarely more than 40. To compensate for the decreased efficiency of gas production by the low-temperature process, we should, were it adopted throughout our works, need to purchase nearly double the amount of coal we now carbonize, which is about 2 million tons per annum. You can imagine what the effect of that would be. New carbonizing plant would be required to replace that now in use, necessitating the expenditure of very large sums of money. The low-temperature gas is also in practice entirely unsuitable for use in ordinary gas appliances by itself, owing to its excessively high calorific value. It is for these reasons that we in this Company do not consider that the adoption of low-temperature carbonization would be in the best interests of either the shareholders or the consumers.

THE CHIEF ENGINEERSHIP.

As I told you at the beginning, the Directors have elected Mr. Goulden to a seat on the Board. I should just like to say a word or two about Mr. Goulden and his splendid services to the Company in the past. He entered the Company's service 38 years ago, and has occupied a position of great responsibility as Chief Engineer for the last 18 years, during which time the Company's business has increased almost by 50 p.ct. He has had great responsibility, and has carried out his duties in an admirable manner. We felt sure that his services ought to be retained, and had great pleasure in electing him as one of our colleagues. I am certain that the Company will benefit largely by his great knowledge and long experience. [Applause.] We have, we believe, found an excellent successor to the great office of Chief Engineer in Mr. Thomas Hardie, who came to us with a reputation already made in Newcastle. He has already proved that we have in him a valuable officer, in whose charge the engineering interests of this Company will be fully maintained. With regard to the staff generally, I cannot speak too highly of their work. They are ably backing-up the Directors in their great and earnest endeavour to carry the Company through the difficult times in which we find ourselves.

THE DIVIDENDS RECOMMENDED.

In conclusion, the result of the Company's working for the year, after paying the statutory dividends in respect of the June half year, is that there remains a balance of £661,000, out of which the Directors recommend the payment of the full statutory dividends on the preference, maximum, and ordinary stocks—viz., 4 p.ct., 3½ p.ct., and £4 13s. 4d. p.ct. per annum respectively. This, with £10,000 to the redemption fund, will absorb £517,000, and leave £144,000 to be carried forward to the credit of the current year, as against £326,000 at this time last year. You will see that the dividend that will be paid for the whole year on the maximum stock will be at the rate of 3½ p.ct., as against £2 12s. 6d. for 1920; and the dividend on the ordinary stock will be at the rate of £4 13s. 4d., instead of 3 p.ct., to which we were restricted under an Act of Parliament that has now been superseded by the Gas Regulation Act. As you will see, we have made a start again with the redemption fund, which was created for the purpose of getting rid of this Company's obsolete capital. A sum of £20,000 in all—viz., £10,000 set aside in June and £10,000 contributed for the December half year—will be available for the purchase and cancellation of ordinary stock.

HOPE OF CHEAPER GAS.

With regard to the future, ladies and gentlemen, I believe we have seen the worst; but the price of gas is still too high to be good for business, and it is the hope of the Directors that during the present year the lower prices of coal and oil and the reductions in working expenses will enable us to reduce the price below 1s. 1d. per therm, to which we reduced it in December. I feel assured, as I said earlier in my speech, that the tide has turned, and that we have every reason for confidence in the Company's future. [Applause.] I now have pleasure in moving:

That this meeting do agree with and confirm the report of the Directors and the Auditors' report and statement of the accounts of the Company as transmitted to the proprietors on the 2nd inst.

The DEPUTY-GOVERNOR (Mr. J. L. Godlee): I have pleasure in seconding the motion.

The GOVERNOR: Before putting the resolution, I shall be happy to hear any remarks.

CONGRATULATIONS FROM MR. H. E. JONES.

Mr. H. E. JONES: I should like to congratulate the Company very much on the conduct of the business during what, as you, Sir, have rightly said, has been a most trying period. I think you have shown great wisdom in bringing to your counsels my old friend Mr. Thomas Goulden; and I thank you as a professional man for your kind words in saying what an engineer can do for the Company. I fully agree with your Ilford amalgamation proposal, as I hope it will lead to a reduction in the price of gas in that district, and to some small extent in your own. I think you are right in carrying out this policy; the railway companies and the electric companies have followed it. Water undertakings also have been gathered together long ago. We, too, must act together; and I am glad to see you are proceeding on those lines. You have alluded to the strike. That was a most formidable and a most improper state of things. They did their very best to paralyze England, and to starve the community; and the community depended upon this Company, in the Metropolis above all, and on the gas undertakings generally throughout the kingdom, for their comfort and safety during that trying period. ["Hear, hear."]. They would not have been able to cook or to warm themselves without your gas. As to the question of the composition of gas, we have found in the past that a great many eminent chemists have come forward to profit from some fault they could find with a public service; but it was said years ago that it was a wise and proper thing to turn a heap of coke into gas if people wanted gas and not coke. During the strike they wanted both; but there were no carts or horses to bring them coke or coal. We have saved the nation, as we did in the war. There is no question about it. We actually did save the community, in the warmth and comfort we gave them. I think the course will be quite clear. You need not be afraid, I am sure—especially as your Chief Engineer has accepted the burden of calling together his colleagues (he is President of the Institution of Gas Engineers) to consider these things. We must bear in mind that any fool could bring us to trouble by calling "Fire!" in this building now; though there is actually no fire, and no danger. There is nothing in all this. Our case is too strong. I valued some eighteen gas-works in America twenty years ago, and had to sleep in the various towns, nearly all of which were supplied with pure water gas. You cannot have a great public service without catastrophe; and this suicidal tendency (which is a weakness of the present time) of people to put their heads inside your cooking-stoves, is a very improper way of using a good gas, for which they are paying a good price. The price is rather high; but we will get it down, with help, and that will get our dividends up with help. We have conferred a great public benefit, as we have done in the past—as we did during the war, when we supplied "T.N.T." which saved the nation. We never got thanked for that. I am glad to think, Sir, your influence has brought alleviation of our financial difficulties; and I hope you will continue to give your services in this way in the future. How you find time to do it all, I do not know.

NATIONAL UNEMPLOYMENT INSURANCE.

Mr. CONWAY: Is it worth while the Company obtaining exemption from the National Unemployment Insurance?

The GOVERNOR: It seems rather hard our employees should have to pay for something that most of them probably never require. It would be an advantage, both to the men and to the Company, that we should obtain exemption, for which we applied some time ago. Apparently great delay has been incurred in the Company getting what has already been granted to other companies. We are, of course, a big company, but why our application should be delayed, I do not know. I have taken the matter up specially with the Ministry of Labour.

A PROPRIETOR'S TRIBUTE.

Mr. W. A. HOUNSOM: There are one or two points I think ought to be emphasized from this side of the table. I am extremely glad that the first speaker, with his great authority, referred as he did to the staff of the Company. But may I, Sir, just for a moment endorse your remarks with regard to those who have passed away—the Directors who have gone during the year that is now behind us? I think

we can pay a very big tribute to Mr. Miles, and his long association with this Company and others, and the wonderful manner in which he stepped into the breach created a few years ago, and became (with his load of years upon him) the Governor of this Company, taking up responsibilities which were at that time very great. Then there is another point which we on this side of the table are all interested in, and that is the return to something like a decent remuneration for the capital which is invested in this Company. We are extremely glad that this has been possible; and we hope we shall go on, and, all being well, get a little more. But there is another item that is outside this Company, and yet is so important, and that is the wonderful way in which certain individuals connected with this Company—you yourself, Sir, and those associated with you—have worked in regard to the general gas problems of the country, and indirectly gas problems connected with the world at large. I should like—and I am quite sure I can speak on behalf of all those present, and many who are not present—to express the gratitude we feel for the enormous amount of work put in outside the Company, but affecting the Company and all other companies. The work has been wonderful. Possibly our gratitude will show itself in asking for more, and in expressing the hope that you and those who have co-operated with you so well will have health and strength to carry on this great work of the National Gas Council and other organizations. I want to say that there is a spirit of combination and co-partnership in connection with this Company which has never existed in the past to the extent which it does now. We rejoice in it; and, though I have said something of this kind before in this room, now that we meet only once a year, and are bound to have fresh proprietors here, it is well that these matters should be reiterated—lest we forget.

THE GOVERNOR'S WORK FOR THE INDUSTRY.

Mr. R. J. NEVILLE NEVILLE: I desire, Sir, to associate myself with everything that has been said with regard to the great services you have rendered to the gas companies all over the country in the work you have done in allaying one of the greatest troubles that any industrial concern has to meet—namely, the labour question. The prosperity which you have foreseen as coming upon us, if it does arise (and I am sure it will, given normal circumstances), must be largely due to the work which you and your Committee have done with regard to grading and zoning of wages all over the country. It has been a magnificent work; and now the industry at last is put in the position that in future the wages will be regulated in accordance with the cost of living. It is a magnificent piece of progress for any industry to attain to; and it must make for the avoidance of that friction which has been the curse of industry for the last few years. The whole industry owes to you personally the very greatest debt of gratitude for the extremely skilful way in which, by delicate negotiation, you have steered the industry through troublous seas into calmer water, which now, owing to your action, allows of the smooth passage of the ship of the industry. Of course, the cost of gas at present is still too high; and every one of us will welcome what you have said with regard to the chances of a lower price. When I look at the balance-sheet, which contains such stupendous figures, and try to analyze how much of the total receipts is spent in wages and salaries, I think perhaps we may congratulate ourselves on providing at this time, when employment is so short, the enormous amount of wages and salaries paid. It must be at the present time a big contribution to the employment of the State.

OUTPUT PER POUND OF WAGES.

But, of course, one of the difficulties which faces the gas industry is the question of the output per pound of wages. I have not worked it out with regard to this Company, but I have in connection with another; and there I may say the output per pound of wages and salaries in 1914 was 24,000 c.ft.; and to-day it is about 9200 c.ft. So in that respect alone there has been an enormous addition to the cost of gas making. I do not think we shall ever get back to 24,000 c.ft.; but I have not the slightest doubt that, with the good management which this Company have enjoyed for many years, the present figure will be greatly improved. If we can get back to anything approximating to that figure, the gas industry will be in a very fine position. There is one other thing we have to thank you for, and that is the way in which you have dealt with carbon monoxide. The general public seemed to think—but you have laid that ghost—that carburetted water gas consists of nothing but carbon monoxide. The only difference, as I understand it, between coal gas and carburetted water gas is that the latter contains a rather greater percentage of carbon monoxide. Both contain carbon monoxide. The outcry has been because carburetted water gas is employed. One would think that we were putting into the pipes of the consumers undiluted carbon monoxide; whereas all that could have happened is that there has been a greater percentage. I am sure you have laid that ghost; and when that is once understood by the public at large, we shall not have so many "bones to pick" with those who think we are going to poison the whole of the country. I welcome Mr. Goulden on the Board. You have done quite rightly in placing there such a well known and skilful administrator. Every shareholder will congratulate you upon the results shown in the report; and every shareholder congratulates himself that at last he is getting back some of the rights that he has been deprived of since the war. The shareholders made enormous sacrifices for the country; and they are glad to think they are now getting back to a reasonable dividend.

After the GOVERNOR had answered a few questions, the resolution for the adoption of the report and accounts was put, and was carried unanimously.

THE DIVIDENDS.

The GOVERNOR: I will now ask the Secretary to read the minutes of the Court of Directors recommending dividends for the past half year.

The SECRETARY thereupon read from the Directors' minutes of the 27th of January the following:

> Resolved that it be recommended to the ordinary general meeting of Proprietors, to be held on the 10th prox., (1) that the sum of £10,000 be set aside out of the divisible profits of the Company for the half year ending on the 31st day of December last towards the redemption fund in accordance with the provisions of the Company's Acts of 1903 and 1909 and the Gas Light and Coke Company (Charges) Order, 1921; and (2) that dividends as follow for such half year be declared—namely:
>
> On the 4 p.ct. consolidated preference stock at the rate of . . . £4 0 0 p.ct. per annum.
> On the 3½ p.ct. maximum stock at the rate of . . . . . £3 10 0 „ „
> On the ordinary stock at the rate of . . . . . £4 13 4 „ „
> All subject to deduction of income-tax.

These recommendations were adopted, on the proposition of the GOVERNOR, seconded by the DEPUTY-GOVERNOR.

RE-ELECTION OF DIRECTORS AND AUDITORS.

The GOVERNOR: I have great pleasure in moving the re-election of Mr. Joseph Lister Godlee, who has been a Director for many years, and has now been appointed Deputy-Governor, in place of Mr. Waterlow.

The Rt. Hon. Sir DANIEL F. GODDARD: I beg to second that.

The proposition was agreed to.

The DEPUTY-GOVERNOR: I thank you very much for this repeated honour in electing me to the Board.

The GOVERNOR: I have much pleasure in moving the re-election as a Director of Mr. Henry Woodall, who has for many years been a member of the Board, and is an engineer of great value to the Company.

Sir DANIEL GODDARD seconded the motion, which was carried.

Mr. HENRY WOODALL: Thank you very much for this renewal of your confidence.

The Auditors (Messrs. J. A. Stoneham and P. H. Ashworth) were then re-appointed.

EXTRAORDINARY MEETING.

AN ORDER FOR AUTHORITY TO ACQUIRE THE ILFORD GAS COMPANY'S UNDERTAKING.

The GOVERNOR: That concludes the business of the ordinary meeting. We have now to constitute ourselves an extraordinary meeting. I will call upon the Secretary to read the notice.

The SECRETARY then read the notice convening the meeting, which stated that at such meeting the draft of a Special Order for which the Company had applied to the Board of Trade under the Gas Regulation Act, 1920, intituled "Special Order granted by the Board of Trade under section 10 of the Gas Regulation Act, 1920 (10 & 11 Geo. V. C. 28), on the application of the Gas Light and Coke Company" for authority to acquire the undertaking of the Ilford Gas Company and for other purposes, would be submitted for the consideration of the proprietors. He also read the heads of the Order.

The GOVERNOR: I do not think I need detain you very long over this matter; but there are just two or three things I want to say. I think it is quite clear to anyone who considers the position that it is advisable for the Gas Light and Coke Company to take over the Ilford Gas Company. Those of you who know the position of that Company will remember that it is an island site, surrounded entirely by our undertaking. This makes it exceedingly difficult for our distribution system, as we have to lay our mains round this large area; and it is therefore advisable that we should come to an arrangement with the Ilford Company to take them over. The district is, we feel sure, a good one, and will afford a further outlet for our gas in the future. There is plenty of undeveloped land there. One clause which ought to be mentioned is that with regard to the Directors' fees. It is proposed to increase them by £2500. They were last fixed in 1909, since when there has been an increase in the Company's business of 40 p.ct. Compared with other neighbouring undertakings, the Directors' fees of this Company are very moderate. The other special clauses of the Order deal in the main with questions relating to the supply of gas and other points of domestic management. The question came before the Ilford shareholders yesterday at a special meeting; and they thoroughly endorsed the amalgamation. So all that is necessary for us to do is to pass the resolution, which I will submit; and the matter can then go forward. Fortunately, it does not now require an Act of Parliament to secure the powers we desire. It can be done by means of a Special Order under the Gas Regulation Act; and we hope the matter will be disposed of in a comparatively short space of time. I now beg to move:

> That the Special Order intituled "Special Order granted by the Board of Trade under section 10 of the Gas Regulation Act, 1920 (10 & 11 Geo. V., C. 28), on the application of the Gas Light and Coke Company," a draft of which is now submitted, and the application of the Company for such Order be, and the same are hereby, approved, subject to such alterations as may be made in such Order by the Board of Trade and approved of by the Directors.

The DEPUTY-GOVERNOR seconded the motion, which was put to the meeting and unanimously passed.

VOTE OF THANKS.

Mr. F. G. PILLEY: I am sure those present will not grudge a few minutes, to enable a very pleasant duty to be performed; and I move that a very hearty vote of thanks be passed to the Governor and the Board. I will join with that our very sincere appreciation of the loyal and consistent work that has been carried out by the officers, staff, and employees during the past twelve months. There is no need for me to comment upon the report. You, Sir, in your speech, brought forward all the points that concern us; and these, and the remarks that have followed from this side of the table, have been sufficient to prove to the meeting the very good work done in the past year. We all know that in every branch we have specialists; and we have full confidence in their ability and skill. With regard to you, Sir, attention has already been drawn to the heavy amount of work you do outside this building. It has been difficult during the past twelve months to read the Press without getting more and more evidence of the energy and work you put in; and this energy and work are always entirely directed to those subjects in which we are interested. Twelve months

ago you assured us that we could reasonably look forward to an increased dividend. If I may borrow a phrase from the other side of the water, I will say that you have "delivered the goods," and this despite the very serious events that so quickly followed the assurance you gave us. I am pleased to combine a vote of thanks to the staff and officers, because I do think to-day marks a very important point in the history of the Company. Mr. Goulden, after many years of arduous service, after filling several posts with increased responsibility and increased credit to himself, is now relieved of the strain and weight of these offices; but the Company at the same time retain his valuable advice. I am sure his inclusion in the Board will be in the best interests of co-operation and co-partnership.

Mr. W. G. BEAUMONT seconded the vote.

Mr. CONWAY: I want to emphasize the fact that, so far as I can learn from inquiry, this Company have re-engaged any and every man who has returned from the war. That is more than can be said of some firms.

The vote was then put, and cordially passed.

The GOVERNOR: I will not detain you longer than to thank you very heartily for your kind vote. It is a great help to us to feel that we have the confidence of the shareholders. It has assisted us in many ways in the difficult times we have been through. I thoroughly endorse the vote of thanks to the staff, who have worked splendidly.

This brought the proceedings to a close.

SOUTH SUBURBAN GAS COMPANY.

Annual Report.

When submitting the accounts for the year ended Dec. 31 at the annual meeting of the Company next Friday, the Directors will present the following report, which is signed by the Chairman (Mr. Charles Hunt).

A coal stoppage of unprecedented duration, lasting for fully three months, was experienced in the early part of the year; and though this tried the resources of the Company very severely indeed, it was fortunately surmounted without putting consumers to any inconvenience—in fact, a full supply of gas of the standard quality was maintained from beginning to end. This result was due to the cordial co-operation of everyone concerned, from the highest to the lowest in the Company's service.

In accordance with the provisions of the Gas Regulation Act, 1920, the Board of Trade issued an Order on April 21 last, placing the Company under the Act, and giving them a new standard price of 15d. per therm, as against the old one of 2s. 9d. per 1000 c.ft. Commencing with the operation of this Order, the price of gas was fixed at 14⅜d. per therm, which was reduced as from the Christmas quarter to 13⅛d. This was made possible by appreciable reductions in the price of coal during the last few weeks of the year. Conformably with the terms of the Order, the calorific value of the gas to be supplied by the Company was declared at 460 B.Th.U.

The quantity of gas sold shows a falling-off of 1·3 p.ct. as compared with the previous year. This reduction is wholly accounted for by a smaller demand for gas for manufacturing purposes.

The net revenue account shows that, including the balance of £8949 brought forward from the previous year, and also an amount of £1396 taken from the reserve fund, and after providing for debenture and other interest, and the dividend of £5 6s. 8d. per cent. per annum paid for the half year ended June 30 last, the amount available for dividend is £29,007. The Directors recommend the payment of a dividend for the past half year at the rate of £5 6s. 8d. p.ct. per annum (less income-tax) on the 5 per cent. ordinary stock.

The Directors who retire by rotation are Mr. Charles Hunt and Dr. Charles Carpenter; and they offer themselves for re-election. Mr. Edward P. Norton, the retiring Employees' Director, has been re-elected by a majority of votes. One Auditor, Mr. Alfred Morland, F.C.A., also retires by rotation, and offers himself for re-election.

Gas Poisoning Fallacies.

Reference was made at last week's meeting of the Accrington Gas Board by Mr. A. J. Harrison (the General Manager) to alleged local cases of gas poisoning. He said many of the statements were a fallacy; and some seemed inspired. So far as the gas industry as a whole was concerned, it was quite capable of looking after itself. If there should be any slight leakage which could not be detected by the nose, it could not possibly do any harm. The percentage of water gas had been less than during any previous winter, because it was too costly to produce. They had only made it when compelled to keep up the supply until the new works at Great Harwood were completed. It was strange that during the coal dispute, when all restrictions were removed, and the Board were mixing 80 p.ct. of water gas with their coal gas, no one knew anything about it, and no one suffered. Cases of gas poisoning had been alleged at a local cotton mill. They had investigated them; and he was certain the gas was the least offender. It was a combination of circumstances which led to the operatives having to leave the mill. If they put a bird in an air-tight box, it would not be long before the bird died. This was what had happened at the mill, snow having blocked up the ventilation completely. In addition, there was the smell from the cotton, oil, and machinery which would in time have an effect upon the strongest. The bogey had been created; and he supposed it would take some time to lay it. There were many cheap appliances on the market; and if any trouble arose, it would likely be caused by these.

National Gas-Engine Company.—The net profits of the Company for the year ended Dec. 31 were £42,258 (against £92,062 in 1920), while £55,923 was brought forward. A final dividend of 1s. per share is proposed on the ordinary shares, making 8¾ p.ct., less tax, for the year, and £33,681 is carried forward. In 1920 the dividend was 7½ p.ct., and in addition a bonus of 3¾ p.ct., free of tax, was paid.

SHEFFIELD CITY COUNCIL AND THE COMPANY'S BILL.

Various matters were referred to at a meeting of the Sheffield City Council last Wednesday—among them the Bill that is being promoted by the Gas Company.

Mr. BLANCHARD, in introducing the minutes of the Parliamentary Committee, made a statement with regard to the proposed petition against the Bill. He said there was no hostility to the Gas Company as such, but that the Corporation had to watch the interests of the general body of consumers. The most important clause to which objection was taken was that relating to the proposed basic price of 9d. per therm. This was equal to about 3s. 7½d. per 1000 c.ft., which meant that the Gas Company suggested they should stabilize the basic price, until 1926, at four-and-a-half times the pre-war price. This was a serious thing for the consumers. It was true that certain other companies had got powers. The South Metropolitan had fixed their thermal rate higher than that of Sheffield; but the circumstances were entirely different, and the present rate of that Company was only about double the pre-war figure. The same applied to three other cities which now had similar powers. The Parliamentary Committee contended that the proposed rate for Sheffield was too high, and that it was in the interests of the general body of consumers that they should present a petition in order to get this, among other things, modified. It was quite likely that they might do something by negotiation with the Gas Company; and he had no doubt the Company would propose to meet them and discuss this and other clauses. But unless the Council presented a petition, they would not be in a position to bargain on even terms. Another point was the borrowing powers sought by the Company. Under their 1917 Act they obtained greatly increased borrowing powers, on the ground that they were building new works at Wadsley Bridge; but these had not been proceeded with. The Company had now over a million pounds of unexercised borrowing powers; and they were seeking authority to borrow £370,000 more. When this money was raised, the interest on it would ultimately fall on the consumers of gas.

LIVERPOOL HEALTH COMMITTEE AND WATER GAS.

A Call for Action.

The following resolution was passed by the Health Committee of the Liverpool Corporation at a meeting last Thursday, at the close of a discussion upon the water-gas question: "That, in the opinion of this Committee, the present system of allowing an unlimited supply of water gas to be used in the city is dangerous to the public health; and that the Board of Trade be requested to take immediate steps to limit the supply of such gas, to insist on the systematic examination of all gas-fittings, and to ensure that gas with a pungent odour be added to all gas supplied; and that a copy of this resolution be sent to the local Members of Parliament."

Alderman W. MUIRHEAD, who presided, read extracts from the report of the Departmental Committee on Carbon Monoxide, who, he said, seemed to be more concerned with the commercial than the health aspect of the question. The Committee recommended non-limitation of carbon monoxide. All the witnesses, it was stated, agreed that the distinctive odour of coal gas was a precaution absolutely necessary; and in this the Committee strongly concurred. He was not going to say anything against the Liverpool Gas Company; but he thought the Committee would agree that it was necessary there should be some limitation of the amount of water gas sent through the pipes. It was all very well to say that people should look after their gas-pipes; but he thought the Company should employ inspectors, and have a systematic inspection of gas-fittings throughout the city.

Mr. JACOB said that they must look at the question all round. He had for some years been an advocate of the use of gas-fires instead of coal-fires, in the interest of atmospheric purity. Then there was the industrial side of the question. Could they limit the production of gas in the city at a time when employment was so much wanted?

Alderman SHELMERDINE said the Departmental Committee spoke of the importance of the gas having a pungent odour. Parliament should be asked to rectify the existing state of things.

A New Meter-Testing Office for London.—The Public Control Committee of the London County Council have for some time been endeavouring to obtain a suitable site for a new gas-meter testing office in substitution for the present Spitalfields office, which is quite out of date for modern requirements. An opportunity has now arisen for securing a suitable piece of ground adjoining the Central Street Council School, Finsbury, at a cost of £4000.

Croydon Gas Company.—The report to be submitted at next Friday's meeting states that in the half year ended Dec. 31 sales of gas were affected adversely as a result of the coal strike in the summer and the mild weather experienced. They were less by 1·02 p.ct. than in 1920. In the half year the number of consumers increased by 1311, and that of stoves on hire by 1502; while 1256 stoves, in addition to a large number of other appliances, have been sold to consumers. There has been a slight reduction in the cost of coal, and the price of oil has been considerably lower, as compared with last year. On the other hand, residuals have realized less favourable prices. The price of gas was reduced from January this year by ⅛d. per therm (3⅜d. per 1000 c.ft.), which will represent a gain to consumers of over £30,000 per annum. It is intended to make a further reduction of ⅜d. per therm (approximately 2d. per 1000 c.ft.) in April. The new holder, which was commenced in 1913, was completed and brought into action in October last. After providing for all fixed charges, writing £2702 off in respect of the Old Caterham works and of property in Wallington, carrying £2000 to the insurance fund and £1000 to the renewal fund, there remains available for division £40,044; and the Directors recommend that statutory dividends be declared for the half year.

SOUTH METROPOLITAN GAS COMPANY.

The Ordinary General Meeting of the Proprietors of this Company was held at the Cannon Street Hotel, E.C., last Wednesday afternoon —Dr. CHARLES CARPENTER in the chair.

The SECRETARY (Mr. Frank Day) read the advertisement convening the meeting, and the minutes of the last ordinary general meeting and the extraordinary meetings. Thereafter the seal of the Company was affixed to the "Register of Proprietors."

THE ADDRESS OF THE PRESIDENT.

The PRESIDENT, on rising to address the meeting, said: Ladies and Gentlemen,—For the first time since the incorporation of this Company, a space of twelve months has elapsed between its meetings. The decision to make them annual instead of bi-annual was undoubtedly a wise one—not the least advantage being the relief to the staff, who have already sufficient periods of high-pressure working. But on this occasion the change proves somewhat of a handicap, since, in order to place before you a faithful picture of our position to-day, I must reconstitute for you one the details of which must to some extent have faded from your recollection—as they certainly have from that of the public at large.

THE GREAT COAL STRIKE.

In the beginning of April in the year now under review, the country was engaged in the greatest industrial struggle it has ever had to face, for during three months the whole of the coal-mining industry was at a standstill. We have had coal strikes before, both costly and extensive; but we have never had one upon anything like such a scale, when the whole outflow of life-blood of the country was arrested for so long a time, with the deliberate idea of compelling the nationalization of that industry, as a prelude to many others. None who have given consideration to the subject could have arrived at any other conclusion than that the struggle was one that was bound to come sooner or later; and we can claim no special wisdom in taking the most complete steps to meet it. With the unstinted financial assistance of the banks, we bought all the coal we could obtain, actually putting into stock about one-third of a million tons. Had the strike lasted a couple of months, we should have got through without serious additional costs to those involved in stocking so much coal. But it soon became clear that this would not be the case; and we had therefore to import coal in large quantities from abroad. France, Belgium, Canada, and America came to our assistance; but the price we had to pay was a heavy one. We fulfilled, however, our duties as a statutory undertaking, since we gave full pressure and quality throughout the period of the struggle; and the people of South London cooked their food, warmed their houses, and fired their heating or steam-raising appliances as if there were no attempt on the part of the mining industry to bring the national life to a standstill. The story does not end there, however. The authorities drew upon the resources we had accumulated, and requisitioned from us both coal and coke for gas-making in all parts of the country.

ASSISTANCE RENDERED.

I will just read a list of those to whom we supplied coal. This will give you some idea of what happened, and the assistance we were able to render to undertakings both far and near. We supplied coal to the gas-works at Aldeburgh, Barnet, Bedford, Bicester, Chatteris, Ely, Eye, Finedon, Hemel Hempstead, Hertford, Huntingdon, Maidenhead, Maldon, March, Melton Mowbray, Mundesley, Newmarket, Northfleet, Northampton, Pangbourne, Peterborough, Stevenage, Toddington, Uxbridge, Wandsworth and Wimbledon, and Watton (Norfolk). The list of gas-works which we supplied with coke for purposes of gas manufacture is a still longer one, and includes Aldershot, Barnet, Bath, Bexhill, Brentford, Chichester, Commercial Gas Company, Croydon, Gas Light and Coke Company, Harrow and Stanmore, Harwich and Dovercourt, Haslemere, Hoddesdon, Hornsey, Horsham, Ilford, Kibworth, Lea Bridge District, Letchworth (Garden City), Maidenhead, Maidstone, Mundesley, North Middlesex, Pinner, Reading, Seaford, Sevenoaks, Sheppey, Southampton, Southgate, Tonbridge, Tottenham and District, Tunbridge Wells, Watford, Waltham Abbey and Cheshunt, Wandsworth and Wimbledon, and Yorktown and Blackwater. We have the impression that the Committee appointed by the Ministry of Mines thought we might have done even more; but I do not think the lists I have given are otherwise than creditable. We certainly had, as far as possible, to remember that we were in duty bound to put in the forefront the requirements of our own consumers in South London. As trustees for them in this matter of light, heat, and power, we gave them the service to which they were entitled, and for which we had no reason to doubt they would be, in due course, quite willing to pay.

MEETING THE COST.

How the cost was to be met, was a matter of policy. In such matters you cannot, of course, consult the consumers beforehand. You have to act in a manner you believe to be in their best interests, and consequently in those of the Company—since the two are inseparable. We could have provided the money by raising the price of gas by 2d. per therm, from 10½d. to 1s. 0½d., for the half year; or we could have reduced the figure by one-half, from 2d. to 1d., and spread the increase over double this period. We chose the latter course, believing it would cause the least inconvenience to the consumers; and we have no reason to doubt the soundness of this decision. This is the explanation of our paying £150,000 of the extra cost of the strike during the period under review, and deferring until the current half year the paying-off of the remainder. Now I think you will understand why we decided we could not see our way to recommend a higher dividend than one at the basic rate of 5 p.ct. Had the coal stoppage not occurred, there is no doubt that we should have been able to pay a dividend little, if any, short of the pre-war rate.

BENEFIT TO BE REAPED.

It is no small achievement to have held substantially our business, as is proved by the fact that we have experienced a lower reduction of output than any of our neighbours; and we shall certainly reap benefit from the consideration we have shown to our consumers. At the same time, I must point out that nothing that has happened reflects detrimentally in any way upon our changed parliamentary powers. We have thrown overboard much hamper which acted as a restriction upon our business. We have greatly simplified our statutory obligations. While still under limitations as to the amount we are entitled to receive by way of dividend for what I may best describe as the use of our money, we are encouraged to improve our working and extend our business by additions thereto arising from the allocation to us and our employees of a share in any resulting profits. But to do this is not obligatory in any way. We must use our own discretion in this matter, in the same manner as would any other commercial undertaking; and I have no doubt that our attitude in exceedingly difficult circumstances—the circumstances pertaining to the early days of April and extending to July of last year—will be confirmed by you this afternoon as having been the correct one. You will also have observed that intending investors will have before them on our balance-sheets a greatly simplified form of capital statement, which will enable them to judge at a glance the circumstances as regards capital under which we are working. While we have obtained more of the freedom for development enjoyed generally by the highest class of commercial and industrial organizations, the public rights have been carefully and fully safeguarded. What we have aimed at is the greatest possible latitude, at the same time giving to the public the security to which they are entitled. I believe we shall be greatly helped thereby in the conduct of our business, and that it will gain in the faith with which it is regarded by the public.

PUBLIC UTILITY UNDERTAKINGS AND THE CORPORATION TAX.

Before leaving this subject of our parliamentary status, I must enter an emphatic protest against the proposal to apply the Corporation Tax to public utility undertakings. One and all of them supply the necessities of life, not the luxuries; and it is on the majority, and therefore the poorer classes, that the incidence of these taxes will fall. One can understand a race-course or a theatre being thus taxed—always supposing the wisdom of such kind of taxation is admitted, which I for one certainly do not. But it does seem unfair that the consumers of gas and water—to name only two necessities in everyday life—should be taxed in this way.

GAS QUALITY AND PRICE.

One sees in the Press a good deal of reference to the present high price of gas. No one with an understanding of the business of gas supply would express any other opinion than that the price is to-day too high, and that in our own interests, as well as those of the public, we must strive by every means in our power to bring it down quickly and substantially. It takes time, however, for the selling price of gas to respond to the changes in the cost of manufacture, whether they are rising or falling. It has never been our policy to anticipate increases; but we do endeavour to anticipate decreases. I have given you some details of these costs as they pertain to the coal stoppage, for instance. The price of coal has been on the down-grade, gradually though surely; but our stocks were purchased at a much higher figure, and the cost has to be liquidated. I have told you how we have been able to keep our business together during very difficult circumstances. Gas sells itself when it is cheap; but it is otherwise when prices are as high as those ruling to-day. Yet the attitude of our consumers is, on the whole, a very favourable one. I am glad to say they are increasing in number; and the figure of the increase in stoves, as stated in the report, is a very satisfactory one, and shows that the public's faith in gas is by no means a diminishing quantity. When you look at these figures, I would ask you to remember that we have not checked our supply on hire or sales of these appliances, as has been found necessary in the case of some other undertakings. We were able to make very good arrangements in the matter of purchasing them; and therefore we did not check their supply. I ought to say this afternoon a word or two about the method of selling gas according to its thermal value, which has certainly come to stay, for the proposal was conceived wholly in the interests of the consumers. Town's gas may have very different thermal or heating values, according to whether it is produced wholly from coal, or enriched with oil gas, or diluted with water gas; and to-day it is thermal value which counts, whether the problem be to light a room or street with incandescent mantles, or to cook a dinner or warm a room. Fortunately, thermal value is much more easily tested than was illuminating value when gas was supplied as being the equivalent of so many candles. If you took a kettle containing (say) a quart of water and carried it to different towns all over the country, and measured the amount of gas necessary to bring it to the boil, you would find this varied everywhere, because the heating value of gas is not a matter of its volume, but of its composition. A British thermal unit is the amount of heat required to raise one pound of water one degree Fahrenheit; and a cubic foot of gas may contain the equivalent of 600 of these units, or it may contain 300, as the case may be. So that, though you paid (say) half-a-crown for the same quantity of each quality, you would be paying for the cost of your kettle boiling twice as dearly in the one case as in the other. This is true of practically all other uses of gas besides kettle boiling. Now, the therm system corrects this inequality of charge, and puts all supplies of town's gas, whatever their intrinsic value may be, upon one uniform and comparable basis—namely, that of thermal value. My personal opinion is that if this had been carried into effect before 1914, there would have been probably fewer grounds for complaint of gas charges during the war and some part of the post-war period. Before long it is hoped that continuously recording instruments will be installed by the Gas Referees all over the country, by which the heating value of the gas supply will be automatically recorded day and night. Meanwhile, testings are carried on in the Metropolis by the London County Council independent Examiners; and I cannot but think that the fact that in South London alone some 6000 or 7000 tests

are thus made during the year must come as a surprise to many consumers of gas, and perhaps to you.

WATER GAS AND SURPLUS COKE.

The next paragraph in the report deals with what may be called the water-gas question. Now, in this matter, we are fortunately able to take an absolutely impartial view; for we have never, except experimentally a very great many years ago—thirty or forty years ago, I should think—made any water gas. When water gas was first introduced on the large scale in Great Britain, it was used as an adjunct to coal-gas manufacture, in order to produce the high self-luminous gas it was the custom to supply before the advent of the incandescent burner made heating gas a greater *desideratum*. The alternative had been to use the rich cannel coal, some of which we produced from our own mines, though the best qualities came from Australia, but which was daily becoming more costly and scarce. In more recent times, a broader use was found for water-gas manufacture, because it solved another problem by converting into gaseous fuel the surplus coke produced in those places where its disposal would otherwise have been difficult. At the same time, of course, the quantity of gas coal required in manufacture was proportionately reduced; and it therefore helped the market in this way too. Being situated on the Thames, with extensive wharfage facilities for anything in the way of craft from canal barges to ocean-going traders, the Company have generally had a good market for their surplus coke; and the manufacture of water gas has never become the necessity to us that it has in many places.

CARBON MONOXIDE.

The principal heating component of water gas is a gas called carbon monoxide, about which you have read so much in the Press. It consumes readily—it is, indeed, generally believed to be the source of the particular brightness you see in a fire on a frosty night. I do not know whether this is true. But, of course, I need hardly say that carbon monoxide is meant to be burned, and not breathed. It is distributed far and wide over our roads and streets from the exhaust pipes of motor vehicles; but no one has ever suggested their use should be forbidden or restricted because of it, even though extremely rare cases have happened, where a vehicle has been shut up without ventilation, when suffocation has been caused. It is also a considerable ingredient of tobacco smoke, whether produced by pipe, cigarette, or cigar; but no one is likely to demand the prohibition or limitation of tobacco smoking because the production of carbon monoxide is an inevitable concomitant. Statistics have proved that the fears of wholesale trouble arising from its presence in some town gas supplies are—at any rate as far as Great Britain is concerned—unfounded. Gas supply has gone on now for something over a century; and it is a very remarkable fact that, unlike the newer electric industry which has had to formulate a great number of rules and regulations to ensure the production and distribution of electric energy being carried on with safety, this has not yet been found necessary with gas. Every undertaking follows its own practice, arrived at as the result of many years' experience; and in our South London district it may be interesting to state that we have not had a fatal accident due to gas poisoning for over twenty years. I think that statement ought to be very reassuring. We are ever seeking to improve the purity of our gas; and I hope perhaps upon another occasion to have something more to say upon this point. Last Saturday morning we had a letter which I should like to read—it was quite unsolicited—from a consumer of many years' standing in our district. The writer says: "I have the greatest pleasure in saying your gas for over fifty years has always been perfectly good, and I consider cheap. I have used gas-fires and cooking-stoves in my houses, six in number, and am quite sure if any trouble exists it arises from not keeping the stove clean; and then there is no cause for complaint—certainly not of the gas." I suppose it is pardonable that I should take up a few moments reading a testimonial from a person who has used our gas happily for over fifty years.

RESIDUALS AND CARBONIZING METHODS.—A COAL PURIFICATION EXPERIMENT.

Now I must not omit to make some reference to residuals. Our residuals are what might be termed high-temperature residuals, and possess their own special qualities and uses. We do not distil our coal to make low-temperature ones, for the reason that—and I think it is a sufficiently good reason—so far as we are able to say, it would not be profitable for us to do so. There is sometimes an impression that the reason we stick to our existing methods is because of the cost of the plant we have provided for that purpose; but, as a matter of fact, our present coal-distilling plant is responsible for a very small part of our total capital outlay; and we could easily scrap it and substitute low-temperature apparatus, if there were any semblance of the working results proving satisfactory. At present, this would certainly not be the case; but we are always ready to discuss proposals for changing methods of treating coal, even if they differ radically from those we have in use, and which have proved so far most effective. At the present moment, we are arranging to instal in our experimental works a process for purifying coal before it is converted into gas. Whether the process is commercially successful, is a matter which only this semi-large scale production can determine. The improvement in the coke would be an obvious collateral advantage; but, as I have said, no opinion we may form is of any use until we have actually tried it on a working scale. We apply to our present coke production a systematic testing control of a similar kind to that applied to the whole of our gas production; and the result is that our coke stands well in the estimation of users, whether at home or abroad. This is very emphatically expressed by those who buy coke for sending abroad. There is no doubt whatever that our coke is regarded preferentially in their case. Similarly, our standard sulphate of ammonia has a high reputation alike among our farmers and foreign buyers. Fortunately, we are now relieved from the obligation imposed upon us by the action of the Board of Agriculture of having to pool our production with inferior qualities marketed by a centralized organization. Our quality is equally suitable for use at home or for export to the farthest overseas markets; and we are not without hope that we shall get back some of the latter business, of which we were so unfairly dispossessed. As regards dye products, on the other hand, the story is a disturbing one. You will hardly be surprised at this if you have noticed that the largest dye producing undertaking in Great Britain has passed its preference dividend. Chemical manufacturers in this country have had in the past to bear much criticism directed against their methods and processes as compared with their continental competitors. It was, indeed, freely stated that the British temperament was unsuited to the production of fine chemicals. This has been proved absolutely unfounded. British chemists—yes, and British workmen—can be trained to be as efficient as the Germans. But no industry on unsubsidized lines could continue in face of the competition which resulted from the unfortunate Sankey judgment. Personally, I find it difficult to differentiate between the ethics of a subsidy to encourage commerce by postal service and one to encourage industry by a chemical service; and I conscientiously believe that the best of both such services is essential to the welfare of the nation as a whole. Before leaving this subject, I must bear testimony to the important work being carried out under the Dyestuffs (Import Regulations) Act, whereby the producers and users of dye chemicals are working together so well to reduce to a minimum our dependence upon foreign products. Two Committees—namely, the Licensing Committee and the Development Committee—carry out between them the very important duties imposed by the Act; and on this machinery the extended re-establishment of the dye-producing industry in this country will largely depend.

CO-PARTNERSHIP.

I think now I have been through the main points of the report; but before I sit down, I want to refer to our co-partnership. Once more this has been severely tested; and while its bonds may be truly described in Burke's words, as "light as air," they have certainly proved strong as iron in binding together the interests of employers and employed. No one regrets more than this Board that the circumstances of the coal strike precluded them from putting into effect the clause in our Act which entitled shareholders and employees to an equal share in the prosperity resulting from good management. A substantial sum should to-day have started its journey into the pockets of both parties. But the Miners' Executive decreed otherwise, when they ordered the coal stoppage; and the sum of something between £300,000 and £400,000 went out of the country from the pockets of South London gas consumers, taking with it our respective shares of surplus profits. Let us hope the last great strike has happened, and that a wider application of the principles of co-partnership will set capital and labour in that light—new to the great majority of employers and employed—in which for over thirty years they have been regarded by this Company.

I have now to move—

"That the report and accounts now presented be received and adopted, and the report entered on the minutes."

The VICE-PRESIDENT (Mr. Frank H. Jones): I have much pleasure in seconding the resolution which the President has just read.

The PRESIDENT: The matter is now open for discussion.

QUESTIONS ASKED.

Mr. HAVELOCK WEST: The first point I should like to raise is with regard to the debenture issue last summer. It seems to me somewhat unfair that you should have issued this stock without first giving all the shareholders of the Company a preferential chance of getting it. What you did was merely to send out a prospectus the night before; and when one looked at the paper the next morning, one saw the advertisement there. This is not what you have done hitherto. It was not fair to go to the outside public, when you had thousands of shareholders who would have taken up the stock. With regard to the extra cost of coal, more than £300,000, we are all very sorry a thing like that should have happened, and hope it will not occur again. Are you still importing coal; and, if so, what is the price of it? What is the produce from this imported coal? Is it of the same value as English coal? Some of our colliers went down during the war. Have they been replaced? What number of stockholders are there in this Company?

THE CASE FOR LOW-TEMPERATURE CARBONIZATION.

Prof. ARMSTRONG: I should like to congratulate you, Sir, upon the paragraph in the report in which you say that this is a coal-gas company. I think these words possess far more meaning than is commonly supposed. ["Hear, hear."] They mean a great deal as regards the quality of the gas. I am glad to be able to testify to the fact that everywhere one goes one does not meet with a gas equal to yours. With it, it is still possible to use a flat-flame burner; and that is rarely the case throughout the country. You have referred to recent statements about domestic gas in the Press, and the fear expressed that people may be poisoned by it. The effect of these statements has been to make gas poisoning fashionable in this country, as it was formerly in the States. Perhaps it would pay you and other big companies to offer a lethal chamber for the use of those of the public who desire to commit suicide. [Laughter.] However, the matter that was raised by Prof. Bone in the papers does deserve to be treated seriously from a much more important point of view. What Prof. Bone had at the back of his head was the fear that that might be done which this Company never can do—to lower the fuel value of the gas to such a point that it will not be usable in ordinary gas appliances. If we are going to make gas heating more used in the future, it will be by improving the quality of the gas, and so enabling people to get better results. Your continuing to make straight gas is a matter of the greatest importance; and I do want to bring it home to people that you are really setting an example to be followed. You referred, Sir, to the poisonous character of carbon monoxide; but I do not think this is appreciated, particularly by those who travel in first-class railway carriages. I attended at your laboratory in the Old Kent Road last week, and saw a cigar smoked there; and then in my presence the gases resulting therefrom were analyzed. To my surprise it turned out that only one-third was air. There was a ratio of two of carbon dioxide to one of carbon monoxide; and there was between 6 and 7 p.ct. of carbon monoxide. What we should do is to tighten our taps and harden

our hearts against any proposal to interfere with the composition of the gas. I do think you ought to look seriously into the future, with regard to the possibility of making a gas such as you are now making economically. I do venture once again to urge upon you that gas should be the bye-product, and that you should not only give us a smokeless gaseous fuel, but also a smokeless solid fuel. There is a great opportunity before you, and you should seize it without delay. I have before urged you to pay attention to the low-temperature process. I could then only speak hopefully; but I can now speak of it as an achieved thing. The coke is superior to anything else we have hitherto used. To that I can testify, having burned it myself for a considerable period. That is bound to come about for various reasons. In the first place, we must conserve all the oil we can get out of our coal. Secondly, there is a reason which is not yet appreciated—that is, it is a method which enables us to keep our coal. You said you bought large stocks. I should like to have some estimate of the deterioration of these stocks in keeping. Few people realize the extent of this. If you carbonize it immediately you get it, you convert it into a form in which it will keep for years. You can convert the most inferior kinds of slack into a material which you can keep as long as you like, and it is worth the price of the best coal. These sort of considerations must tell in the long run; and I do hope you will take into account the importance of associating the solid fuel industry with your gaseous fuel industry.

Mr. C. WEBB: I should like to ask whether it is your intention to issue any fresh capital. If so, we do not want to spend all our savings, but would like to keep something for what is good. We could see the silver lining to the cloud two or three years ago; but now I can see a little bit of gold mixed with it.

THE PRESIDENT'S REPLY.

The PRESIDENT: With regard to the complaint which has been made by a shareholder who did not get up early enough to secure his allocation of stock, I can only say that we gave the shareholders the fullest possible notice, not only by means of the meeting, but by the report thereof which we sent round, that we should be in due course issuing stock. Now, in a matter of this kind it is most important to select the right moment for placing the stock. It must also be remembered that there had not previously been any issue of the kind pertaining to gas to enable us to judge how it would be received on the market. We took the highest financial advice; and the issue was made at what we were told was exactly the right time, and under the most appropriate conditions. By the mid-day post we dispatched the circulars informing our shareholders that the stock would be on sale the following morning. As a result of that, people in towns all over the country were able to act on the circular, and apply in time for the stock they required. Special consideration was given to shareholders in that their applications up to £5000 were allotted in full, while those from other applicants were drastically cut. Looking back, I really do not see, in the circumstances, that we could have followed any other course.

As to other questions, I need not, of course, say that we are not buying any coal from abroad now; but since I have been asked, I am bound to say that some of the coal we got from America was of a higher quality than the best coal produced in the North of England. With regard to ships, it is true we were unfortunate during the war. We lost eleven; but we replaced them, and have now something like the normal number that we think we can economically run. When considering the question of the storage of coal, it must be borne in mind that the amount of coal we use in the winter time is much more than in the summer. We have done our best to flatten-out the load—to straighten the curve—by securing summer consumption; but we still have to carry coal stocks from the summer to the winter. We cannot do without a reservoir to make up the differences between the flow of coal to us and its use in the retorts. We do not propose to issue any fresh capital at present.

With reference to the points raised by Prof. Armstrong, I can assure him that the fuel question in its broadest aspects is not being overlooked by us. One of the advantages of the simplification of our position as a statutory company is that we are enabled to take a broader view than that of being merely a gas company; and we are very carefully investigating the problems pertaining to carbonizing coal under different conditions—not only carbonizing purified coal under ordinary conditions, but carbonizing ordinary coal or specially prepared coal under other conditions. The question of intermediate products is one of great importance to the country; but, after all, the bedrock of our business is fuel in one form or another. That is how we live; and that is how we make the bulk of our profit. I can assure you that we have before us the great possibilities of smokeless fuel. I am not sufficiently far-seeing to picture a city like London wholly using gaseous fuel. I think there is room for gaseous fuel and a smokeless solid fuel, because until the British constitution alters very much people will like an open fire somewhere. We are exploring the various avenues, at the end of one of which we hope to find something good one of these days. The number of stockholders is 16,000.

I think I have answered the whole of the questions, and will therefore formally put the motion. It is carried.

THE DIVIDEND.

The PRESIDENT: I now have to move—

> "That dividends as follows for the year ended Dec. 31 last be now declared—viz., 5 p.ct. on the redeemable preference stock and 5 p.ct. on the ordinary stock, and that warrants be transmitted to the registered addresses of the proprietors by post for the amount of such dividends less the interim dividends paid in respect of the first half of the year."

I will ask Mr. Richbell, our lately-elected employee Director, to second this.

Mr. PHILIP RICHBELL: Before seconding the motion, I shall be glad to take the opportunity of expressing my sincere thanks for the honour conferred upon me by electing me to the Board, where I trust the experience gained by a lifelong connection with the Company may be of service. I shall always do the best possible in every way to advance the interests of the Company. I beg to second the motion.

The resolution was then put to the meeting, and agreed to.

RE-ELECTIONS.

The PRESIDENT: I have now to move that Mr. John Mews be re-elected a Director of the Company. I think he is the oldest member of the Board; and I have much pleasure in moving his re-election.

Mr. FRANK BUSH: As a Director, Mr. Mews has had long experience of the manner in which the business of the Company is carried on; and I am very pleased to second the motion.

The resolution was carried.

Mr. MEWS: I have much pleasure in accepting this office, and wish to thank you for the renewed mark of your confidence.

The PRESIDENT: I now have to move that Mr. Arthur Matthews Paddon be re-elected a Director of the Company. Mr. Paddon's association with the gas industry is so wide and so great, that I need not say anything in support of this proposal.

Mr. KENNETH P. HAWKSLEY: I have much pleasure in seconding the motion.

The resolution having been passed,

Mr. PADDON said: I have all through my life been connected with gas undertakings in one capacity or another, and am particularly proud to serve such a company as the South Metropolitan.

Mr. CHARLES P. CROOKENDEN, acknowledging his re-election as an Auditor, said: With regard to the issue of stock, it is very easy to be wise after the event. I was one of the disappointed ones; but I think the Directors took the only possible course, and have every reason to be gratified with the result, as the stock now stands at a substantial premium.

The PRESIDENT: That completes the business.

VOTES OF THANKS.

Mr. HAVELOCK WEST: I should like to propose a hearty vote of thanks to the President and Directors.

Mr. WEBB: I will second that.

The proposal met with unanimous approval.

The PRESIDENT: On behalf of my colleagues and myself, I thank you cordially for your vote. During the last seven or eight years, I should have regretted if at any time it had been suggested that another hand than mine should hold the tiller; but the good ship has now got out of the troubled waters, and is sailing in comparatively smooth ones. I should therefore not feel the matter so seriously as would have been the case in the past. You have been very forbearing during the trying and difficult years in question, and I wish to express my appreciation of that. Now I am on my feet, I should like to draw your attention to our great indebtedness to our staff. We have a staff that is, I assure you, second to none in the country; and anyone connected with gas would endorse this. We cannot have all the staff answering for themselves, and therefore I will call upon Mr. M'Leod to respond on their behalf, because I assume you are at one with me in desiring to express your approval and thanks for their work. ["Hear, hear."]

Mr. FREDERICK M'LEOD (General Manager), in reply, said that he had never felt more conscious than he did on that occasion that his colleagues deserved the vote which had been just passed. He believed that every one concerned with the South Metropolitan Gas Company would remember 1921 as one of the most eventful and anxious years in his whole experience. The technical staff—that was, the manufacturing side, which was directed by engineers and chemical technicians—had maintained the high excellence of the previous year's working, as was shown by the figures appearing in the report and also reflected in the uniformly good reports that came to hand from the authorities who carried out the official tests. The no less important branch of the Company's work—that dealing with commercial matters—had been equally well attended to. The loyal assistance given by the rank and file to those in authority was greatly appreciated and was largely due, he was convinced, to the spirit of co-partnership which had been cultivated in the Company's service for more than 30 years. In the name, and on behalf, of all he thanked the meeting for the kind and generous vote.

The proceedings then terminated.

Electric Light Failure at Hampstead.—A short-circuit caused the extinction of the electric light in the Rosslyn Hill district, Hampstead, for some hours last Wednesday night. Candles were at a premium. The Hampstead supply is controlled by the Borough Council.

City of Durham Gas Company.—At the annual meeting of the Company, the Chairman (Mr. G. Chapman) stated that the year had been a most trying one. Costs of all kinds continued to rise, and the revenue from residuals had fallen. The coal strike caused great worry and expense, as well as a big decrease in the quantity of gas consumed; the result being a loss on the first half of the year. Since then there had been a gradual improvement in residuals; and he predicted a better year than they had had since 1913. There was an available balance of £3374. Mr. J. Mawson, seconding the adoption of the report, said they had applied the "Geddes Axe" in the matter of management expenses. The Directors decided to pay a dividend of 5 p.ct. on the original capital, and 3½ p.ct. on the additional capital, for the half year to December last, less income-tax.

New Plant to Cheapen Gas at Warrington.—Complaint was made at the monthly meeting last week of the Warrington Town Council that the price of gas (4s. 9d. per 1000 c.ft.) did not compare favourably with the price in other towns. Several members suggested a committee of inquiry into the working of the concern. This proposal was welcomed by members of the Gas Committee. Mr. Locker (the Chairman of the Committee) reminded the Council that a consulting engineer appointed by them three years ago made suggestions for the improvement of the concern, which were now being carried out. The Committee were hoping to make a saving by the installation of the new plant, to the extent of producing gas at a cost of one-third less than at the present time. The Council must not forget that in the past huge profits had been taken from the undertaking to relieve the rates. The water-gas plant which was installed in an emergency to increase the supply was, in view of the peril of carbon monoxide gas, to be discontinued immediately.

BRENTFORD GAS COMPANY.

Annual Meeting.

The Annual General Meeting of the Brentford Gas Company was held at Caxton Hall, Westminster, on Wednesday last—Mr. R. J. N. NEVILLE, the Chairman of the Company, presiding.

The SECRETARY read the notice convening the meeting; and the seal was affixed to the register of shareholders.

The SECRETARY read the minutes of the last annual general meeting.

THE THERM BASIS AND ITS EFFECT.

The CHAIRMAN, in moving the adoption of the report and accounts, said it was his duty to make a short statement as to the business of the Company during the past year. He supposed that in the whole course of the experience of everyone who had had anything to do with trade, the year 1921 would be marked as one of the most difficult. In the case of their own Company, it was a peculiarly marked year. In the first place, they had completed a century of existence, so that they were now well on in years; and he hoped, if they were in existence for another hundred years, they would be able to show equally consistent progress at the end of that time to that which they had shown during the hundred years they had already been in existence. In the second place, it had been a remarkable year because the general basis upon which gas companies charged for their product had been altered by the Gas Regulation Act, which was passed the year before last, after an inquiry held by Parliament as to the best method of supplying and charging for gas. They therefore had left the old volumetric standard of charging for gas by the 1000 c.ft., and had been shifted to a new standard—viz., they were now selling by the number of heat units which the gas contained (the thermal basis). This was a very important matter indeed for all gas companies, who were enabled now to sell a gas most likely to be used efficiently by their consumers. They were not tied-down, as they were before, to a fixed standard, which might have been very useful for lighting purposes, but less efficient and less useful for heating. Gas companies were able now to select and choose the gas which they supplied to their consumers; and this would enable the price of gas to be lowered as they obtained more experience and knew how things were working. The Brentford Gas Company had declared that the thermal basis upon which their gas was to be sold was 460 B.Th.U. per cubic foot. This made it rather difficult to compare, because they were no longer on the 1000 c.ft. basis, but were charging so much per therm. In their case, 1000 c.ft. was equal to 4·6 therms. This gave a very unwieldy figure indeed to deal with in arranging the accounts; but it was believed that the public would receive a great advantage as the result of the new system, because now they would be paying for the heat which they got, and the suppliers of gas were under very much more stringent obligations with regard to the uniform quality of their gas than they were before. There was now a system of continuous testing going on from hour to hour—instead of the old test which used to be, when they charged by volume, once a day. Thus the public were protected by the provisions of the Gas Regulation Act for arriving at the actual quality of the gas and for forcing the companies to supply a uniform gas. He need hardly say that the Brentford Company, and almost every other company, did not confine themselves to supplying merely the amount which was declared; but they supplied a gas of a higher calorific value, and kept up continuously the supply of gas at a higher calorific value, than that which had been declared. This was for the purpose of seeing that there was no chance of a statement being made that the Company were not supplying what they declared. Therefore they gave full measure and flowing-over. The change in the legislation to which he had referred was an enormously important one. Practically the whole of the gas industry had now changed over, or was being changed over at the present time, from the volumetric basis; and the gas industry owed a great debt of gratitude to the administrator at the Board of Trade and the staff, by whom Orders were dealt with. A very large number of Orders—some 200—had been issued, and the whole industry owed a debt of gratitude to the officials of the Board of Trade for the way in which they had managed to get through this great number of Orders, which had been passed after a careful consideration and examination of the facts of each separate company. There were some companies who were waiting at the end of the year for their Orders; but, on the whole, the industry was to be congratulated on the way in which the Board of Trade had shouldered the burden and carried through the many complicated Orders which they had made. The Brentford Company obtained their Order—as some of them would remember—since the last meeting. They were not in possession of the Order this time last year, but obtained it at the end of March; and they made their declaration of the standard of declaration of calorific value on April 1 last year. It was then declared that the Company would supply 460 B.Th.U. gas as and from that date. They also fixed the price of their gas at 14·6d. per therm—*i.e.*, there was a difference between the price at which they decided to sell and the price which was the standard under the Order—viz., 17·8d. per therm. Having declared that the price would be 14·6d. per therm, this gave a number of steps as compared with the standard price. The steps now, instead of being 1d. per 1000 c.ft., were 0·2d. per therm; so that there were considerable steps between the actual price and the standard. It was because they had been given this new standard that they were in the happy position of being able to pay the shareholders for last year the same dividend that they used to pay before the war. They were able to do so on this occasion with a surplus of about £12,000 as well; so that the shareholders might congratulate themselves on the way in which the Company had come out of a very difficult situation. Shareholders had been a very long-suffering crowd, if he might say so, ever since the year 1915. No doubt they remembered that the Brentford Company were not forced to raise the price of gas directly the war began. They did not, in fact, increase the price until the war had been in progress for eighteen months. This was largely due to the foresight of their excellent Engineer, who happened to be caught—as all good men were caught when there was an emergency—fully prepared; for it so happened that the Company then had a larger stock of coal on their premises when the war began than he believed they had ever had in the course of their previous history. It was interesting to know that the shareholders had lost in dividends—*i.e.*, there had been a shortage, compared with their pre-war dividends, of £142,000 during the period which they called the war period, and, in addition to this, they had had to deplete, in order to pay the miserable dividends which they were allowed to pay under the Temporary Charges Act, the undivided balance by some £60,000. Therefore they might say that the price which the shareholders paid during the war period until the present year was something like £200,000. Working this out, it meant that they had lost two whole years' dividend by the operation of the sliding-scale; and they would be losing it to-day if it were not for the benefit which they had obtained under the new Gas Regulation Act which, under the new standard to which he had referred, enabled them for the first time to pay an increased dividend. The shareholders could congratulate themselves upon the new standard which enabled the Company to pay these dividends. The consumers could also congratulate themselves on this point, because, unless the capital stock of the Company could increase and appreciate in value, the Company could not borrow at a remunerative rate—the cheaper they could get capital, the better it was for the consumers of gas, because the industry had not got to pay such large amounts in interest for the capital which it obtained.

THE COAL STRIKE—THE COMPANY'S FORTUNATE POSITION.

Another very serious matter during the year was the coal strike. He had just said that when the war came their Engineer was not caught napping; and, curiously enough, when the strike came their Engineer happened again not to be caught napping, with the result that the Company had been extraordinarily fortunate as compared with a very large number of other companies, who were badly hit by the effects of the coal strike. The Brentford Company had a very good stock of coal indeed at the beginning of the coal strike, and Mr. Johnston (their Engineer) was able to eke-out this stock throughout the whole of the coal strike; and at the end of the strike, when it ceased on July 1—after having started on All-Fools Day—they still had 10 or 14 days' supply on the premises. A great many other companies were not so fortunate, and had to buy foreign coal. He believed he was right in saying that about £4,000,000 worth of foreign coal—American and other coal—was brought into the country during the strike for the purposes of the gas companies; and he also believed the London Companies used about £1,000,000 worth of foreign coal, or about one quarter of that which came in. The Directors of the Brentford Company did get a little bit concerned when they had only 10 or 14 days' stock in hand, and they did buy a small quantity of foreign coal (which arrived three weeks after the strike ended); so that they did extremely well with regard to this matter. The coal strike had a great deal of effect not only on the gas companies, but upon every industry in the country. When they came to think of it, this country was about the only one in the world that could not afford to strike. Some people seemed to think that this was a country that could afford to strike every day; and during the past few years we had had such a terrific quantity of strikes that the whole business of the country had been upset and the stability upon which our progress—and, indeed, our food—depends had been very largely interfered with. No country could so ill afford to strike as ours, with the exception, perhaps, of Belgium. The reason was that we were wholly unable to feed ourselves, and must depend upon foreign trade for the purposes of bringing food into the country. We had a population of some 40 millions; but we could only feed 8 or 10 millions. Thus there were at least 30 million people to be fed by foreign trade; and if we did not have foreign trade, we should not be able to get the necessary food. What, then, was to be done with the odd millions? There had been strikes in the past, and there probably would be more strikes in the future; but he did hope people would understand what their position was with regard to food, and how it was that we were only capable of purchasing food. The world was not going to keep England in grain from philanthropy; and unless we exported our goods, we could not really say that we should be free from famine. Everybody ought to understand this position. When coal was affected it went to the very root of everything; and the price of coal really had dominated the whole situation. He was glad to say that the price of coal was going down at the present time, and everything else would also go down, in some way or other, in proportion to the price of coal. But when they looked at the accounts for the past year, they would find that, in spite of the reduction which took place towards the end of the year, coal was more expensive to the Company in 1921 than in 1920. Now, however, he was glad to say the prospects with regard to coal were better than they had been. The result of the coal strike to the Company was that they had to eke-out their coal as best they could, and to do what the Government asked them specially to do; and that was to get the greatest possible value out of the coal. This lesson had been taken to heart; and the Company had considered in every way how it was possible to economize coal and get the best value out of it. As a result, during the year they had instituted a large number of economies which it was believed would bear fruit in the immediate future; but they would see in the report that there had been a reduction in the output of 1·39 p.ct., or, roughly, 1¼ p.ct. When they considered that the Government prohibited all illuminated advertisements, and reduced the amount of gas which could be used for power purposes by 50 p.ct.—and, of course, with the coal strike there was less trade and therefore less gas used for lighting, power, and illumination—and also that there was much less money being circulated among the working classes (and the Brentford Company largely relied on the working classes for its consumption of gas through slot meters), he thought the only thing they need really be astonished at was that the reduction in the consumption of gas only amounted to so small a percentage as rather less than 1¼ p.ct.

INCREASED OUTPUT OF GAS FROM COAL.

In addition to this, he would point out that last year was phenomenal in regard to weather, both from the point of view of sunlight

and dryness, and also from the point of view of temperature; so that none of them need feel the slightest alarm at the fact that there was a reduction of only 1½ p.ct. in the consumption of gas. Against this decrease they would see by the accounts that there was a reduction in the amount of coal carbonized—viz., 211,000 tons, against 255,000 tons the year before. Notwithstanding this large reduction, the output was only down 1½ p.ct. The quantity of coal saved was very much larger than this, and no doubt some of them would be wondering how it was, with so very much less coal, they were able to get an output which was so little short of what it was the previous year. What had happened was that they had got a very much larger make of gas per ton of coal. The output of gas per ton was more last year than the preceding year by 1500 c.ft., and this had helped enormously, both with regard to the accounts and the output. They obtained practically 10 p.ct. more gas per ton in 1921 than in 1920, although they did not use so much coal—in other words, with 90 p.ct. of the raw material used in 1920 they were able, in 1921, to sell 98½ p.ct. of the 1920 output. Of course, they had had to use every sort of appliance possible for the purpose, and they could say that the prosperity of the Company was very largely due to the way in which the coal had been handled by the Engineer and the staff. This had also enabled them to tide-over a very great difficulty. They had also done another thing. The difficulty of coal had been so great that it became more important than ever to see if they could get the right class of coal; and they would at once see what a difference it made. If they had a bad class of coal, they had to pay the same freight, which was a very heavy item—it amounted to 14s. or 15s. per ton into the works. They paid the same freight whether it was good or bad coal. Moreover, they required more of the bad coal than of the good in order to get a given efficiency. The result was that it was most important to get the right kind of coal; and they had put their whole mind to getting the very best coal and reducing the cost of freight and transport as much as possible. To this end they had, during the year, installed coal-testing plant on a large scale, which had enabled them to make many economies with regard to the purchase of coal. These economies would be still further shown with ordinary luck and normal circumstances in the coming year. A large number of other economies had also been effected which would bear very full fruit later on.

TRANSPORT ORGANIZATION.

They had been threatened, as everyone knew, by railway strikes, and every other sort of strike; and the Company had had to do their best to meet difficult circumstances which might arise, very often suddenly. They therefore now possessed their own means of transport. They had ships which had run when other ships were hardly able to run—ships always ready to take cargoes when they were there, so that they did not have to pay demurrage and other things. They had also a large number of trucks; and the fact that they had trucks at the colliery sidings ready to take a cargo had often enabled them to get cargoes of coal to London, whereas had they had to trust to other people's trucks, or the railway company's trucks, they might not have got the coal. Thus they were much better able to get their coal into the works than they were before the war. They had also a lot of new plant at the present time, most of which was nearly completed and some actually completed. They had also further facilities for coal handling—such as additional sidings at Southall and a new dock there also. There was a small piece of land between the railway and their works with a dock in it, and the Company had acquired it. This, together with the new railway sidings at Southall, would enable them economically to work a large portion of their land and save a great deal of demurrage for trucks and things of that sort. Then they had bought land at Brentford on the river which would also give further facilities for coal storage. They also had machine shops and a small foundry, which was very useful during the moulders' strike. There were some new retorts at Southall; and new purifiers had been installed there, as well as at Brentford. Further, they had got what they believed would save trouble and money in the future, and that was the permission of the Port of London Authority to put out over the bed of the river a pier or gantry. The result was that at Brentford they now had a structure which would enable them to handle coal more economically. This pier had been equipped with hoppers, which would enable them to deliver coal into the retort-houses economically, efficiently, and quickly. All this work had been going on partly during the last two or three years, and chiefly during the past year; but while the Temporary Charges Act was in operation, the shareholders were unable to get any benefit from their expenditure. If they looked at the capital account, it would be seen they had spent £306,250 on capital; and he thought they would get the advantage of this very shortly. These were the chief things which had happened during the year; and before he went to the accounts—he did not know that there was very much to say upon them—perhaps the shareholders would like to know what the situation was to-day. The price of gas had been reduced by 1d. per therm (which was equivalent to nearly 5d. per 1000 c.ft.) as from Jan. 1. The price now would be 13·6d. per therm, instead of 14·6d. per therm, for the coming year. The accounts did not show a very big reduction yet, either in wages—which, of course, were coming down—or in raw materials; but if that tendency prevailed during the present year, no doubt the reduction in wages and raw materials would be reflected in the accounts next year. He thought they could look forward during the coming year to a period of increased prosperity and increased efficiency, providing things were normal and there were not other coal and transport strikes, and nothing happened to alter the present tendency of affairs. Wages, of course, were coming down. Not only were the wages of the workmen coming down, but also those of the staff had been reduced and brought more into line; and as prices fell, there would be a further benefit from this. The price of coal to-day was much below what it was twelve months ago; but it was still more than twice as high as it was before the war. He forgot what they used to get it at; but it was something like 8s. per ton at the pit head. The lowest they had heard of since, however, was more than double this figure; and until they really got coal down in price they would not be on the old stable basis of before the war. But so far as one could see, these things were going to happen.

RELATIONS WITH THE WORKMEN.

They had had a year of great tranquillity with their workmen. They had submitted to reductions of their wages during the period, and there had been no sort of friction with them. There was a decrease of 6s. in their wages in the summer. This decrease came off 3s. in July and 3s. in September. This was very largely due to the splendid work which had been done by one of their Directors, Mr. D. Milne Watson, who had been Chairman of a Committee who had dealt with the question of wages. They had now got on to a sliding-scale based with regard to their own men—and all the gas industry was on that basis to-day, which he believed would make for the peace and efficiency of the industry—on the index figure of the Board of Trade as to the cost of living. Mr. Milne Watson had arranged a most difficult matter with regard to wages all over the country. They had already had the benefit of reductions of 2s. in November and 6s. in January; and as the cost of living went down, no doubt there would be further reductions in wages. The arrangement of the wages in a large industry such as this, covering an enormous number of different sets of conditions practically all over the country, and the grading and zoning and matters of that sort, had been a very complicated business. The industry owed the greatest debt of gratitude for skilful helmsmanship to Mr. Milne Watson, who piloted the ship into safe waters after a great deal of very choppy seas. The gas industry was very greatly indebted to him and his colleagues for the work which they had done. They were, in the Brentford Company, on the best of terms with their workmen; and it was hoped to meet them in every possible way that was reasonable. A Works Committee had been set up, so that it would be possible to deal with grievances. He hoped that, in the future, they would have, as they always had had in the past, the best of relations with their men. The trade union leaders of the men had always shown themselves, so far as the experience of the Company was concerned, very reasonable men indeed; and they had been of great assistance to the industry. Many people might, perhaps, think that this was hardly likely; but in the gas industry, at all events, the trade union leaders had been reasonable men, and had dealt with things in a reasonable manner.

THE ACCOUNTS.

With regard to the accounts, they would see in "D" account that a reduction in the price of coal was being shown, because there was a decrease of £29,000 in the price of coal and oil and the expenses of handling. Summarizing the accounts shortly, it could be said that there was a net reduction in favour of 1921 over 1920 in expenditure of roughly £50,000 during the year. There was very little else to be said. During the year they had issued £300,000 7½ p.ct. mortgages and £6250 7 p.ct. mortgages. This was done through the office, and done very well and very efficiently, by the Secretary and his staff. Many companies would be glad if they could raise £300,000 without any underwriting and without advertisement—simply from the shareholders, and at such a very small expense. This expenditure appeared in account "D," and was included in the general charges. The net result was shown at the bottom of account "D." The balance carried to the profit and loss account was £164,875, as against £73,128 in the previous year. This seemed to him the crux of the whole position so far as the shareholders were concerned; and it enabled them to pay their full pre-war dividend and to add £12,000 to the undivided balance. He had told them at the beginning they had lost £60,000 during the war, which had had to be taken from the undivided balance to eke-out the miserable dividends. Now, he was glad to say, they were enabled to pay back £12,000 of this amount, which was an important matter. He did not know whether they remembered that gas companies under Act of Parliament were limited in regard to the amount of their carry-forward. He did not consider this was always wise, and, during the war, the position of affairs showed that it was not particularly wise. The law was that they were not allowed to carry forward more than one year's dividends. They had never been able to carry forward anything like one year's dividends for a very considerable number of years. On the contrary, they had had to borrow from the bank in consequence. They could see the effect of borrowing from the bank in account "L," where it would be seen that the overdraft from the bank was £138,691; so that if they were prevented from filling-up the undivided balance, they had no money to carry on with. It required two-and-a-half to three times the amount of working capital now as before the war, because wages, coal, and everything was up. It was better they should have the undivided balance unrestricted and not have to borrow in the way they had to at present.

He moved—"That the Directors' report and statement of accounts as published for the year ended Dec. 31, 1921, be received and adopted and entered on the minutes."

Sir ROBERT SHAFTO ADAIR, Bart., seconded the resolution.

REMARKS BY SHAREHOLDERS.

Mr. SAMUEL SPENCER said that the reduction in sales in the case of the South Suburban Gas Company was 1·3, and they had not got such a carry-forward as the Brentford Company. Therefore, the Brentford Company had done exceedingly well. In the case of the South Suburban Company, the sales had increased by 15 p.ct. during January; and no doubt the same was the case with Brentford, thus wiping-out last year's reduction altogether.

The CHAIRMAN said the percentage was about the same in the case of the Brentford Company.

A SHAREHOLDER expressed the thanks of the meeting for the way in which the affairs of the Company had been managed.

A LADY SHAREHOLDER asked, as a consumer of gas, whether it was correct to say that the pressure of the gas had gone down. Whenever she called-in the gas-fitter to see to her stoves, he always said the trouble was due to the Company's reducing the pressure.

The ENGINEER (Mr. A. A. Johnston) said it was not correct to say that gas companies continually changed their pressure. The aim of all gas undertakings was to keep the pressure as even as possible; but there were at times variations, due to the great use of gas at certain hours for cooking or heating, and at such periods there might possibly be a slight falling-off in the pressure. It was, however, the aim to

keep the pressure as constant as possible, because it was only in this way that the best results could be obtained.

A SHAREHOLDER asked if they might hope to get the heating power of gas back to what it was before the war. He used to get greater heat from his stoves when the gas was sold on the basis of cubic feet.

The CHAIRMAN said there would be no advantage to the consumer to have the number of thermal units in the gas increased. If they had a better class gas—*i.e.*, one with a larger number of thermal units per cubic foot—they used less gas to get a certain result; and if there were a fewer number of thermal units per cubic foot, then they used more gas. But they only paid for the thermal units; and these were the same in both cases, so that it was as broad as it was long. He knew there was general prejudice about this; but it should not exist, because the quantity of heat units burned for a given service in the two cases was the same.

The SHAREHOLDER said his stove did not give the same heat as before.

The ENGINEER said there was a great deal of misapprehension with regard to the quality of gas. His experience was that the consumption of the average consumer had not grown to any appreciable extent since the introduction of the lower qualities of gas; and this, in his opinion, was a very sound measure of the effect. The position was as stated by the Chairman; and the final result was as broad as it was long. If the shareholder who had raised the question as to his stoves would apply to his gas company, he was certain they would attend to the stoves, which was probably what was wanted.

The SHAREHOLDER: It is your Company. [Laughter.]

The ENGINEER said that if the shareholder would write to the Company they would be pleased to send and put the stove right. It was probably some little adjustment that was needed.

The CHAIRMAN said the Company were taking up the question of hiring stoves again; and he did not think there would be any cause for complaint as to the efficiency of stoves in the future.

The SHAREHOLDER said these were his own stoves already installed.

The ENGINEER said he would undertake to have them put right.

The motion for the adoption of the accounts was then put to the meeting, and carried unanimously.

THE DIVIDENDS.

The CHAIRMAN then moved: That a dividend at the rate of £5 p.ct. per annum on the 5 p.ct. preference stock, at the rate of £5 12s. p.ct. per annum on the "A" consolidated stock, and at the rate of £5 10s. p.ct. per annum on the "B" consolidated stock, be paid on the first day of March next.

Sir ROBERT SHAFTO ADAIR, Bart., seconded; and the motion was carried unanimously.

On the motion of the CHAIRMAN, seconded by Sir ROBERT SHAFTO ADAIR, Mr. D. Milne Watson and Mr. William Mann were re-elected to the Board.

Messrs. Monier F. Monier Williams and Alfred Bevis were re-elected Auditors, at a fee of 300 guineas instead of 200 guineas, as hitherto; the proposal for the increase coming from the shareholders without any previous notice to the Directors.

VOTES OF THANKS.

Mr. R. W. EDWARDS (Aldershot) proposed a hearty vote of thanks to the Board for their work during the past year, and commented upon a number of matters which have affected the gas industry recently, principally the coal strike and the passing of the Gas Regulation Act. The coal strike had cost the large metropolitan gas companies £1,000,000; and from this fact it could be realized that the cost of the strike to the whole country was enormous. Too much importance could not be attached to the change from the old condition of things to the new under the Gas Regulation Act; for it enabled each gas undertaking to supply the quality of gas best suited to its particular needs. Further, it was impossible to exaggerate the importance of cheap capital and cheap coal as the prime factors in the prosperity of the gas industry. Another thing which the Gas Regulation Act had done, in addition to restoring the pre-war rate of dividend, was to give the shareholder security as to the continuance of dividends, which he had never had before. In the old days no revision of the sliding-scale could be obtained unless they went back to Parliament; and then very often the revision was in the wrong direction. Under the new Act, they could go to the Board of Trade and ask for a revision in the light of adverse circumstances if these were such as to reduce their dividends; and the importance of this could not be impressed upon gas shareholders too much.

A hearty vote of thanks to Mr. Johnston and the staff and workmen was carried with acclamation.

The CHAIRMAN acknowledged the vote of thanks; and the proceedings terminated.

Compagnie Générale du Gaz.—At the ordinary general meeting of the Compagnie Générale du Gaz at the end of last year, the Board reported a slight improvement on the previous year's working, and were able to recommend the payment of a dividend of 5 p.ct.; carrying forward a larger sum. The Company's ten gas and eight electricity undertakings in France, and six gas and three electricity undertakings in Belgium showed greatly improved results; but the dullness of the bye-product market caused a reduction and the revaluation of these stocks. No income was realized from investments in Greece—notably from the Compagnie Internationale du Gaz or the Société Hellénique du Gaz d'Athènes.

Lighting of New Southwark Bridge.—At a meeting of the Court of Common Council of the Corporation of London held last week, the Bridge House Estates Committee presented a report with reference to the lighting of the new Southwark Bridge, and submitted for approval an arrangement arrived at with the South Metropolitan Gas Company with respect thereto. This was unanimously agreed to. By the adoption of the report, the lamps on the standards will be lighted on the "stagger" method—two lamps on every other standard, instead of every standard as at present. This will approximate more to the ordinary form of road lighting. The matter, it may be remembered, was referred to during the recent Public Works, Roads, and Transport Congress (see "JOURNAL" for Nov. 23, p. 556).

TOTTENHAM DISTRICT LIGHT, HEAT, AND POWER COMPANY.

The Annual Meeting of the Company was held last Friday, at the Offices, No. 639, High Road, Tottenham—the Rt. Hon. Sir DANIEL F. GODDARD in the chair.

The SECRETARY (Mr. E. J. K. Fussell) read the notice calling the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN, in moving the reception and adoption of the report and accounts, said he confessed that during the past year he had had many qualms of fear lest the hopeful estimates he gave at the last annual meeting might not be fulfilled. They had been passing through a year of great anxiety; but he was happy to say that those fears had all been dispelled, and they were able to present a satisfactory statement. There were four outstanding features during the year which would, he thought, take their places in the history of the Company. The first was the issue of the Tottenham Gas (Charges) Order, 1921, by the Board of Trade, under the Gas Regulations Act, 1920. It was not quite on such generous terms as they had hoped; but, on the whole, they were satisfied with the results which they had got in the Order. Under this their new standard price was 17⅝d. per therm—about 6s. 7¼d. per 1000 c.ft. The effect was to remove previous restrictions, and restore to them the power of paying the pre-war dividend, of which they had been deprived ever since. This explained how it was that they were able to pay larger dividends on account of the half year ended in June.

EFFECTS OF THE COAL STRIKE.

The second point was the deplorable dispute in the coal industry, which lasted three months—from the beginning of April to the end of June, and affected the trade and prosperity of the country in a very serious manner. It involved their Company in serious financial loss; it was difficult to estimate what they had lost. Many industries in this neighbourhood had to close down. They were the Company's customers, and a large consumption of gas was lost to them. Again, the gas they were in the habit of supplying for public lighting and power was curtailed by order of the Government; and there was another serious loss. A more direct loss was in the fact that they were obliged to buy 4000 tons of American coal, which cost over £6000 extra. This did not include all the loss, because the coal was of so bad a quality that it involved a great deal more labour; and the results obtained from it were very much smaller than they got from English coal. Yet he was happy to be able to say that, notwithstanding all this difficulty, through an anxious period they were able to maintain a full supply of gas for domestic and industrial purposes without a single break. That was a fact upon which they might very well congratulate themselves. The third point was that during the year they obtained a Consent Order which increased their borrowing powers. Up to that time, those powers were limited to one-third of the ordinary stock issued and paid. This Order enabled them to increase their borrowing powers up to half the capital raised. This was very important when they remembered how difficult it was to raise ordinary stock without unduly burdening the capital account.

THE COMPANY'S CO-PARTNERSHIP SCHEME.

His fourth point was that at the last annual meeting it was stated that, as soon as they obtained the Order under the Gas Regulation Act, and were paying something like pre-war dividends, the first thing to be considered would be the readjustment of the position of their co-partners. During stress of wartime their co-partner scheme practically came to the ground. The price of gas had to be raised, and there was no bonus payable to them at all. The Directors felt that this was a great hardship on them, and allowed *ex-gratia* payments enough to keep their pension fund going during that time. He was glad to say that the promise made at the last meeting had been fulfilled; and from the beginning of this year they entered on a new scheme. The old scheme had been completely revised after consultation with the Co-Partner Committee; and it had their entire approval. The basis of the scheme was that the co-partners should receive on basic earnings a like dividend paid to "B" stockholders. Under the old scheme, the bonus was divided into two moieties—one to be retained and invested in "B" stock; the other, after deducting two-thirds contribution to the Pensions Fund, was available as cash. It gave co-partners very little practical control over the bonus. The new scheme provided that the whole bonus should be free, subject to one compulsory deduction only—*i.e.*, every co-partner must first acquire £5 of "B" stock and become a shareholder. The disposal of his bonus was left to his discretion. He would, of course, have to keep up his payment to the Pension Fund, and could do so out of earnings or bonus as he chose. He would be paid the balance of bonus half-yearly, as shareholders received dividends. This scheme would involve a further charge on the funds of the Company; but he believed, as the proprietors had always taken a deep interest in the co-partnership, that they would agree with this scheme in order to secure the goodwill of the employees.

THE ACCOUNTS.

Turning to the accounts, he said that during the year they had raised £91,650 by the issue of 7½ p.ct. redeemable mortgages. This was very successful, and enabled them to pay-off some heavy loans from the bank. On capital expenditure, there was payment of £2500 for Dyson's land, which was adjacent to their own, and £66,797 had been expended at the Ponders End works, which had now been almost entirely reconstructed in a most modern way. It was very satisfactory to know that they had this adjunct to their business. The new works there were capable of turning out three million cubic feet of gas per day. They had installed a water-gas plant (which was never there before), which added one-third to the capacity of the works. New mains, meters, and stoves took rather a large amount—£38,932; but it indicated business, as more consumers were constantly coming forward. On electricity, £12,629 had been expended on capital account. This was a healthy and growing business, and was yielding over 6 p.ct. on capital outlay, and was increasing from year to year. In revenue, there was one interesting fact. The total expenditure for the year was

£21,504 less than the previous year, and, as the receipts for the year were almost identical with those of the previous year, it meant that they had made increased profit, gross, of £21,882—this notwithstanding the fact that £10,000 had been deducted from profits for renewals, as against £6000 in the previous year. Working results had been good. There was a decrease in the quantity of coal used, which they would easily understand; the decrease in cost of coal being £34,729. It was not so much a decrease in the cost—3s. per ton—but it was reduction in the quantity used. The make of gas improved very much, and was really a great compliment to the activity and care of the Works Engineer. During the year the make of gas had increased from 12,261 c.ft. to 13,443 c.ft.—an increase of 1182 c.ft. for every ton of coal put into the retorts. He took that opportunity of congratulating Mr. Smith, the Works Manager, on this excellent result. They had used more oil, partly because the price was coming down. This year they paid an average of 8¾d. per gallon, as against 11¾d. last year; but the lowering of price only made an additional cost of £200 on the whole year. Wages had decreased £9000—largely due to greater efficiency of the works. It meant that they had been able to produce gas with fewer men, and also meant a certain reduction in wages towards the end of the year. After conferences between representatives of the men and the industry, they arrived at very fair and reasonable terms, which based reduction of wages on the reduction of cost of living. Repairs and maintenance had slightly increased. Rates showed an increase of £4885; he was sure they would acquit Directors of any blame in this matter. Health and unemployment insurance showed an increased cost of £1300.

THE REVENUE SIDE.

On the receipts side there was considerable increase in the sale of gas, and increased rental of stoves, &c., of something like £19,266. At the last annual meeting they began to talk about slump in residuals; and this had gone on through the whole year, showing a decrease of £62,475. The previous year the average price obtained for tar was 9¾d. per gallon; last year they only made under 5d. gallon. Sulphate, which in 1920 made £14 10s. 7d. per ton, only made £2 15s. 6d. last year. The electricity department showed increased profit of from £1917 to £3391. As a result of careful inquiry, the Directors felt that they would be right in giving notice of reduction in the price of gas by 1d. per therm, equivalent to 4¼d. per 1000 c.ft., from the beginning of this year. Penny-in-the-slot consumers would get an additional cubic foot per penny, which meant a reduction of 5½d. per 1000 c.ft. This reduction meant £55,000 per annum to consumers; but it had another effect which his hearers would welcome, because it would entitle them to increased dividends—£7 17s. 6d. p.ct. on the "A" stock, and £6 7s. 6d. p.ct. on the "B" stock. He must, however, add this caveat—they must earn it first, and be able to show that they had made that profit. Comparing how this reduction of 1d. per therm affected the various participants, he mentioned that consumers would get £55,000, or 87 p.ct., of benefit; shareholders, if they made a full profit, would get £6800, or 11 p.ct.; while the co-partners got much less. In conclusion, he said the prospects for the current year were good. As the result, they hoped, of their new charter—the Order of 1921—stocks were improving in value. At the beginning of last year, the "B" stock could be bought at about £50 per £100; he doubted if to-day the same stock could be bought for £80. They had not got up to where they were before the war—the "B" stock at £117 per £100; but it was an encouraging move up, for which every proprietor would feel grateful.

Mr. H. BAILEY seconded the resolution proposed by the Chairman.

Mr. T. MOORE congratulated the Directors on the success of the year, and expressed his gratitude to the staff, who had put in much hard work.

Mr. RIDDELL was pleased to hear that the co-partnership scheme had been dealt with on a new basis; but the Directors had rather missed an opportunity to bring themselves into line with a democratic age, as they had not given co-partners an opportunity of being represented on the Board.

The CHAIRMAN remarked that they were all of the opinion that, while they had been able to make some small reduction in the price of gas, they considered the present price too high, and would not be satisfied until they got it lower.

The resolution was then carried unanimously.

THE DIVIDENDS.

Mr. HENRY WOODALL (the Deputy Chairman) proposed the payment of full statutory dividends—viz., at the rate of 5 p.ct. per annum on the preference stock; 7½ p.ct. on the "A" stock, and 5¾ p.ct. on the "B" stock, all less income-tax—leaving an undivided balance carried forward of £18,263. He thought nobody would begrudge the shareholders this increased return on capital. They had had a pretty bad time; and he hoped that now they were coming back to something like normal times.

Mr. GEORGE HAY MORGAN, K.C., seconded the resolution, which was carried unanimously.

RE-ELECTION OF DIRECTORS AND AUDITOR.

Mr. H. WOODALL proposed the re-election as a Director of Sir Daniel Goddard.

Mr. H. D. ELLIS seconded; and the proposition was agreed to very cordially.

The CHAIRMAN proposed, and Mr. JAS. RANDALL seconded, the re-election, as Director, of Mr. H. Woodall, which was carried unanimously.

On the motion of Mr. CASTELLO, seconded by Mr. F. R. SMITH, Mr. W. Cash, F.C.A., was re-elected Auditor.

VOTES OF THANKS.

Mr. CASH returned thanks, and proposed a vote of thanks to the Chairman, Directors, officers, staffs, and workmen.

Mr. W. G. BROWN, in seconding, said they could congratulate themselves that at last they were coming to happier and brighter times. He was glad that the Directors had so favourably considered the matter of the co-partners. The more the workmen, the proprietors, and others came into close contact and dealt with such matters amicably and in a spirit of goodwill, the better it would be for all concerned.

The proposition was carried unanimously.

Mr. A. E. BROADBERRY (the Chief Engineer and General Manager), on behalf of all embraced in the resolution, expressed thanks to the proprietors. It was a delight to everyone to have been in any way instrumental in bringing about such successful results as were before them that day. It was due to the fact that the works had nearly got back to pre-war efficiency. There were some troubles; but they were disappearing; and, under the leadership of Sir D. Goddard, supported by the Board, and with the goodwill which he knew was felt by all in the service, he hoped that they would be able to look forward to the future with pleasure and confidence.

THE "SPECIAL" MEETING.

The meeting was then made "special," and a resolution, proposed by the Chairman, was agreed to authorizing the Directors to raise moneys, as required, under the Company's Acts, 1906 and 1913, and Capital Issues Consent, 1921, and to pay off or issue stock.

CARDIFF GAS LIGHT AND COKE COMPANY.

Addressing the shareholders at the annual meeting last Thursday, Mr. Charles E. Dovey, F.C.A., J.P. (the Chairman), stated that the year 1921 had been one of extreme difficulty in all departments of the business. The coal strike, the serious and continued unemployment, and the stagnation of trade, were factors which had the effect of considerably reducing the consumption of gas and contributing to a diminished output. The Company were endeavouring to make-good overdue repairs, in order to bring the various sections of their plant into proper condition again; and though progress had been made in this direction, much remained to be done both in the works and on the district. Under the Cardiff Gas Act, 1921, which had obtained the Royal Assent in the course of the year, the 5 p.ct. dividend was no longer a maximum one, but a standard dividend with possibilities of increase due to good management. While the consumers would enjoy the principal share of the benefit in the reduced price of gas, the shareholders and co-partner employees were enabled to divide between them the remaining one-third of the surplus. The three parties concerned in the business of the Company were thus given the same objective—namely, a reduction in the price of gas below the basic price fixed by Statute. As the cost of manufacture was reduced, the Company would exert its utmost endeavour to make such further reduction in the selling price of gas as might be possible. From next quarter-day, the Directors hoped to take off 1d. per therm from the selling price. The present charge was 1s. 0·6d. per therm. The new price would therefore be 11·6d. per therm—a reduction roughly equivalent to 4¾d. per 1000 c.ft. Thus the Board would in six months have reduced the charge from 1s. 2·2d. to 11·6d. per therm, equivalent to a reduction of 12½d. per 1000 c.ft. The Board hoped also to revise the charges for large quantities, so as to secure additional concession in price to those consumers. He knew of no undertaking where there was a closer or more intimate association in all matters than existed between the Board and the executive officers of the Cardiff Gas Company. They were not wedded to tradition, nor captive to old practices, but claimed to be in every way a progressive business undertaking.

The meeting decided to declare dividends of 5 p.ct. per annum on the ordinary stock and 4½ p.ct. per annum on the preference stock.

A special meeting was afterwards held which authorized a further issue of capital under powers conferred by the Cardiff Gas Act, 1921.

NEWPORT (MON.) GAS COMPANY.

The 156th half-yearly meeting of the Company was held on Monpay of last week—Mr. George Geen, J.P., presiding. The Chairman said the Directors had given effect to the reduced cost of coal and labour by promptly lowering the price of gas to consumers. Two reductions, each of 1d. per therm, had been made, equivalent to 8½d. per 1000 c.ft. The present price was 1s. 4d. per therm. Though the result of the half-year's working had been generally satisfactory, they had to deplore, with every other gas undertaking, the complete collapse of the market for ammoniacal liquor, which at the moment was an unsaleable commodity. There had been practically no expenditure of capital during the half year; the sole item being £366 for new meters. Energetic steps had been taken to deal with the serious repair work left by the war. Mr. Geen said the shareholders would join with the Directors in congratulating Mr. T. H. Hazell (their Secretary), who had just completed fifty years of service with the Company, upon his long and blameless career. A dividend was declared of 5 p.ct. for the half year, and an addition of ½ p.ct. due for the half year ended June 30, 1919. A sum of £1295 was transferred from the profit and loss account to the reserve fund. In replying to a vote of thanks passed to himself and to the staff, Mr. J. H. Canning, O.B.E. (the Engineer and Manager), mentioned that there were now 32 students in gas-fitting at the Newport Technical Institute, whose fees were being paid by the Company.

An Inquiry into Hedon Gas Charges.—The Board of Trade have acceded to the request of the Hedon Corporation to hold an inquiry into the price of gas charged by the Hedon Gas and Coke Company, Ltd. The borough, situate a few miles from Hull, is the smallest county borough in the country—an old-world place that enjoyed greater prosperity than Hull in years long since past. At a public meeting, the Mayor stated that originally the price of gas was 9s. 2d. per 1000 c.ft.; but, after negotiation, it was reduced to 7s. 6d., and then to 6s. 9d. The latter figure is considered to be still excessive. A resolution was passed at the meeting protesting that the charge of 2s. 1d. per therm which the Gas Company are seeking authority to schedule is considerably in excess of the figure provided for in section 1 of the Gas Regulation Act.

MANCHESTER AND THE STRETFORD GAS-WORKS.

A Reply by Mr. W. M. Carr to Mr. William Newbigging's Report.

In last week's "JOURNAL" [p. 328], some extracts were given from a report by Mr. William Newbigging to the Chairman of the Manchester Corporation Gas Committee on the present position of the Stretford gas undertaking in regard to existing plant and expenditure. This report has called forth the following reply in the columns of the "Manchester Guardian" from Mr. W. M. Carr, of Ormskirk:

The carbonizing plant was reconstructed for operation by stoking machinery with telpher plant for removal of coke in 1912, and is in excellent structural condition. This Mr. Newbigging does not deny. The renewal of the regenerative retort-settings common to all gas undertakings has been well maintained, and these have still two-thirds of their life to run, confirmed by details supplied by the Manchester Corporation. The capacity of the carbonizing plant is 192 tons per day, and not 144 tons as stated in Mr. Newbigging's report. This we are prepared to prove by demonstration. The average yield of coal gas per ton of coal at Stretford is 12,900 c.ft.; but, taking Mr. Newbigging's low figure of 12,000 c.ft. per ton, the capacity of the plant is 2,304,000 c.ft., and not 1,728,000 c.ft. There is no deficiency in coal-gas plant with present consumption necessitating the manufacture of water gas except in the case of emergency load and when costs of coke and oil are favourable.

The problem of the Joint Board to meet the future demands is one which they welcome; and it is gratifying to have Mr. Newbigging's assurance that the increase in consumption will in the near future be equivalent to no less than 1,000,000 c.ft. per day. What a happy position for the Stretford undertaking—an assured demand for an increased production! Surely every business man would regard guaranteed sales to meet the cost of extension of plant with the greatest possible satisfaction; and while Mr. Newbigging sets forth the position that increased plant is required to satisfy immediate increased demands, he strangely omits to allow any credit for obviously increased revenue. But surely he cannot be serious if he suggests that, to meet this estimated increased demand of 1,000,000 c.ft. per day, a capital outlay of £80,000 is necessary.

What are the real facts? At the present time I am extending an existing horizontal retort-house for an increased capacity of 1,000,000 c.ft., at a cost, according to tender, of under £35,000, including alteration to telpher plant. Furthermore, it should be noted that with present falling prices the cost of a like capacity extension at Stretford will be even less.

Mr. Newbigging's insinuation that the Joint Board do not recognize that extensions of the coal-gas plant will be necessary to meet future demands is, to say the least, improper. They do recognize; but they are not blind to the increased revenue therefrom, nor do they propose to meet such extensions by the adoption of water-gas plant.

The facts with regard to the existing water-gas plant are as follows: The capacity of the plant is 500,000 c.ft. per diem. There are also buildings and auxiliary plant already constructed for a second unit of 500,000 c.ft. per diem, which can be completed at a comparatively small expenditure; thus greatly enhancing the value of the plant for stand-by and emergency purposes and for use when cost of coke and oil are favourable.

The statements quoted from speeches made by the late Mr. Isaac Carr and myself in November last require to be quoted fully in order to convey a true impression; and it should be understood that the speeches were in reference to conditions existing at the time they were made. It would have been more respectful and reasonable to have quoted fully the late Mr. Isaac Carr, whose remarks on this point were prefaced as follows:

> The crux of the matter was the cost of coal and residuals. It was impossible for any man to say which was the best system, for while one might be the best system to-day, another might be to-morrow. It was impossible for any one industry to control the cycle of commercial events, which always would vary; and those engineers who were able to turn out a product to meet varying cycles of commerce were the most fortunate.

The cycle of commercial events is operating to-day in the falling prices of coke and oil. It is not unlikely therefore that those undertakings having the necessary plant will find it to their advantage in the matter of cost to manufacture water gas. The Manchester Corporation expert is fully aware of these conditions; and this is evidenced by the fact that the Corporation have stated that they will maintain the water-gas plant at their Bradford Road works, which, according to their figures submitted to Parliament, they will have to continue in use until the completion of their Partington station, when it will operate when desirable and when required. The usefulness of the plant for emergency is emphasized by the fact that had not the Corporation had this water-gas plant during the coal strike their costs would have been enormously higher.

The capacity of the purifiers at Stretford is, according to the formula of the late Mr. Thomas Newbigging, sufficient for a make of over 3,000,000 c.ft. per diem. The Manchester Corporation's expert must be aware that the total purifying capacity available at Stretford is so much in excess of present requirements that the management have set apart one-third of the purifiers for use with water gas only.

Mr. Newbigging's figure of £100,000 required to meet a future increased demand of 1,000,000 c.ft. per day will not stand investigation.

As already stated, with respect to the future extension of any portion of the plant to meet the rapidly growing consumption, it is obvious that the revenue from the increased consumption will provide the additional interest on the necessary capital expenditure.

Swansea Gas Company's Reduction.—The Swansea Gas Company have decided to reduce the price of gas to 15·4d. per therm, a reduction equivalent to 1s. per 1000 c.ft.

NOTTINGHAM AND THE THERM BASIS.

Considerable criticism was forthcoming at the last meeting of the Nottingham City Council, in regard to the recommendation of the Gas Committee [*ante*, p. 329] that the necessary steps should be taken to obtain authority to charge for gas by thermal units.

Mr. H. GOVER FORD (Vice-Chairman of the Committee), in moving the adoption of the report, pointed out that this was not a matter in relation to which isolated action was being taken by one Corporation, but formed part of a settled policy affecting the whole of the country.

Alderman DOUGLAS MCCRAITH (Chairman of the Watch Committee) said what he desired more particularly to know was whether the suggested change would affect the price of gas.

Alderman H. BOWLES (leader of the Labour party in the Council) observed that, when the report was before the Council at the previous meeting, he was successful in getting it referred back for information. He had this information now; but it wanted a dictionary to assimilate it. If the proposed system were adopted, it would mean practically taking the control of the price of gas out of the Gas Committee's hands. His opposition to the proposal of the Committee was that it would lead to the creation of more officials; and he suggested that the Council should let the matter drop. There was at the back of the new system, he thought, an effort on the part of those who comprised representatives of gas undertakings and companies to get the price of gas fixed for the whole of the country, so that the municipal competition of well-managed and well-equipped undertakings should not operate against some of the privately-owned concerns. He failed to see what else it was but an attempt to exploit the public in an increased price for gas.

Mr. GRIFFIN, to test the feeling of the Council, moved an amendment, which was seconded, for the reference back to the Committee of the report, which it was suggested should be translated into popular language, and show what benefits (if any) would accrue to consumers from the proposed change.

Mr. S. G. WARD declared, however, that the Committee had no intention of increasing the price, though they might be working at a loss; and he pointed out that no centre near Nottingham was charging as little as 4s. 6d. per 1000 c.ft.

Mr. GOVER FORD, in reply, said the proposed new system would enable the consumer to get as good gas as at present at the same price. Allusion had been made to the Gas Committee's having exploited the public; but such an allegation was grossly unfair. The Committee for a long time had been working under great difficulties, mainly in regard to the character of the coal supplied; but he contended that Nottingham had as good gas as was supplied in any city, and considerably cheaper than most. There were ample safeguards for the consumer under the thermal system. There would be no increase in cost. The present standard was 480 B.Th.U., and the price paid was 4s. 6d. per 1000 c.ft. This would be also the standard maintained in the future.

Mr. A. PARKER (a member of the Committee) suggested that it could not be too widely known that the cause of the poor gas was bad coal. To-day, however, it was 20 p.ct. better than it was five or six months ago; and perhaps in another six months, when they could get some Yorkshire coal, it would be much better still.

The amendment, for referring the report back for further consideration, was lost; and the Committee's recommendation as to the changes in the system of charging, by substituting thermal units as the basis, was adopted.

LEIGHTON BUZZARD GAS CHARGES.

Since the announcement in the "JOURNAL" of Jan. 25 [p. 218] of the statement in defence of the Leighton Buzzard Gas Company's application to the Board of Trade for a standard price per therm, there have been heated discussions among the local authorities (who acted jointly) over the cost of opposing the application.

At the last meeting of the Leighton Council, Colonel Macarthur expressed the opinion that the Council had no right to pay a cheque for £180—the cost of the opposition—without its being sanctioned by all the authorities concerned. The opposition was the action of a Joint Committee; and he thought it only fair that this Committee should have been called together again to receive the report and consider the account. In the first place, they were told that the cost was going to be £30; and now a bill for £180 came in. The Clerk to the Council pointed out that the original cost of £30 was for the engineer's report only. The initial costs were to be from £50 to £70. The bulk of the costs arose out of the Joint Committee's decision to fight. Up to that time, they were only slightly above the estimate of £70. Colonel Macarthur maintained that the Council had no right to pay out on behalf of the other Councils. The discussion dropped, on Mr. Chapman's saying that the other Councils would have an opportunity of going into the charges when the bill came before them.

The Linslade Council were very indignant that, while the opposition was undertaken by joint action on the part of the four local authorities in the gas-consuming area, the Leighton Council should have taken upon themselves the responsibility of passing and paying the accounts incurred. In reply to the Linslade Council's application for details of the expenditure, the Clerk of the Leighton Council wrote and enclosed a statement of the expenses incurred. He added that £100 of the expense arose as the result of the decision of the Joint Committee to fight the Gas Company, in consequence of the gas engineers on each side being unable to come to terms. Captain W. C. Prudames said that, as a member of the Joint Committee, he must tell the Council that the accounts had not yet been before that body. It was eventually decided to call a meeting of the Joint Committee to discuss the accounts.

Seaford Gas Company's Price Reduced.—The Directors of the Seaford Gas Company, Ltd., give notice that the price of gas will be reduced by 9d. per 1000 c.ft. as from the Christmas readings.

THOMAS PIGGOTT AND CO., LTD., BIRMINGHAM.

A Centenary Dinner and Some Historical Notes.

The well-known firm of gas and water engineers, Messrs. Thomas Piggott and Co., of Atlas Works, Spring Hill, Birmingham (founded in 1822), held their Centenary Dinner at the White Horse Hotel, in that city, on Saturday, the 4th inst. Alderman H. Bewlay was in the chair, owing to the absence of the Chairman of the Company, Mr. Arthur Ll. Lloyd, and was supported by Mr. Nevill H. Everitt, Mr. T. P. Barker, and Mr. A. Dyson, his co-Directors.

Mr. Bewlay, who has been actively and prominently connected with gas and water engineering for nearly half-a-century, in a witty speech outlined to the staff the history of the firm. He pointed out that they received their first order for two gasholders for the Chartered Gas Company, Horseferry Road, London, in the year 1826 or 1827; the holders being 40 ft. in dia. by 14 ft. deep. It is noteworthy that since that time Messrs. Thomas Piggott and Co. have built almost every gasholder in Liverpool and Belfast.

The firm having completed their centenary, it is of some interest to note the number of years during which the Directors have been connected with the business, and the length of services rendered by some of the staff present at the dinner.

Mr. Arthur Ll. Lloyd (Chairman)	45 years.
Alderman H. Bewlay (Director)	60 "
Mr. Nevill H. Everitt (Director)	25 "
Mr. Thomas P. Barker (Managing-Director)	40 "
Mr. Arthur Dyson (Assistant Managing-Director)	21 "
Mr. Gilbert (Chief Draughtsman)	25 "
Mr. Teece (Chief Estimator)	20 "
Mr. Woodward (Leading Estimator)	31 "
Mr. Allen (Fitting Shop Foreman)	27 "
Mr. Edwards (Constructional Yard Foreman)	24 "

SOME OF THE WORK CARRIED OUT BY THE FIRM.

Steel Piping.

In 1889, an article appeared in the "Engineer," the following being the opening sentences: "It has from time to time been mentioned in our columns that contracts have been given out and executed for considerable quantities of water, air, and gas mains, made, not of cast iron, as usual, but of light mild-steel sheets, either welded or riveted. It will be interesting to our readers to know that there is every prospect of this trade in light steel pipes becoming a regular one, and even of attaining large dimensions. It is at first sight difficult to understand how steel pipes can compete in price with cast iron; but it must be remembered that the cost of a pipeline per mile consists, not only of the cost of the pipes, but of the transport, freight, and laying them, and also that the steel pipes on an average only weigh one-fourth or one-fifth of the weight of their cast-iron competitors, and can be constructed to require only one-third of the number of joints when placed in position. Messrs. Thomas Piggott and Co., Ltd., of Birmingham, have been the pioneers in this trade, having introduced it in 1880, and ever since been more or less actively employed in it." Then are given particulars of a number of large contracts carried out by the firm, and in hand, in this connection.

Gasholders.

In the gas industry, Messrs. Piggott and Co. hold a unique position, having completely equipped many gas-works; and they have for a period of over thirty years been makers of Messrs. Humphreys and Glasgow's water-gas plants. Even so far back as 1892 the firm held a record for gasholder construction, having built the following number of holders in the cities named:

Belfast	10	Liverpool	24
Leeds	9	Nottingham	9
Bristol	10	Sheffield	6
Leicester	7	Vienna	5

In all, the firm have built over 600 gasholders in the British Isles alone.

Bye-Product and Chemical Plant.

During the last few years Messrs. Piggott & Co. have entered vigorously into the manufacture of chemical and bye-product plants, having designed and erected sulphate of ammonia plants, tar distilling plants, benzole plants, oil rectification plants, and complete tank installations for oil loading and storing.

Patent Pressed-Steel Tanks.

During the coal strike and the foundry strike, Messrs. Piggott & Co. were able to supply numerous firms with storage for oil and water from their patent pressed-steel tank stock—a practice being made of keeping at least 1000 plates in stock.

General.

To obtain an answer from Messrs. Piggott & Co. as to what they make, is more difficult than to obtain an answer regarding the things they do not make. The works being self-contained, with well-equipped pattern shop, foundry, fitting shops, boiler yard, constructional shops, erection yard, and separate works for welded pipes and marine furnaces, the resources with regard to the production of gas-works plant, chemical plant, and general engineering are unlimited. Starting a hundred years ago, the firm made iron canal barges, following on with gas-works plant. Gas-works, as already mentioned, they now equip from start to finish.

Wicklow Gas Dispute.—A meeting of the Wicklow Urban Council and ratepayers declined to entertain a suggestion of the Chief of Staff of the Local Government Board of the Irish Provisional Government for arbitration in regard to the dispute which has now extended over three months as to the price of gas. This dispute, it may be recalled, led to a boycott of the gas supply by the bulk of the consumers. The meeting appeared determined that the boycott should continue.

LONG EATON CASE AND ITS SEQUEL.

Memories of a notable case in which the High Court laid down an important principle as to the rights of private gas undertakings in relation to attempted inequitable competition by public authorities, will be revived by some scathing criticism which has been forthcoming at Long Eaton, during the past few days, of the extraordinary methods which are now alleged to obtain in regard to the conduct of the electricity undertaking of the local Council, who it may be recalled were defendants in the action in which there was delivered a judgment of far-reaching significance.

Ratepayers locally have become alarmed at the allegations, which rest upon no less an authority than that of Mr. J. Pegg, himself the Chairman of the Electricity Committee. It has been known for some time that the electricity undertaking has not represented a paying proposition—there being a considerable overdraft at the bank—and the latest condemnation of procedure has added greatly to the general dissatisfaction. *Inter alia* Mr. Pegg has stated that a Babcock & Wilcox boiler, upon which £8000 has been expended, is not required; that many meters have not been registering the consumption of electricity, that no tools are available, that the works (contrary to statements in the Council chamber) are in a shabby condition, and that the Electric Light Committee have had no knowledge of the amount of money that was expended nor how it has been spent. In dealing with the position generally, Mr. Pegg stated that the station was a very shabby place; and the Committee were determined to assist Mr. Newey (the freshly appointed Engineer) in bringing about a speedy improvement.

Following upon these statements, the Committee have decided to make certain additions to the staff, in order to promote, if possible, some measure of efficiency.

Gas Supply and Housing Schemes.

The question of the supply of gas to their housing scheme was brought up in the Worcester City Council last week, when Alderman Leicester moved a resolution asking the Council to rescind a motion passed at the January meeting, authorizing the extension of the electric mains for lighting to the houses on the Bromyard Road site. He said it was felt the carrying-out of the proposal would jeopardize the promise extracted from the Government, after a very considerable fight, to pay something towards the cost of the gas-mains. He read an extract from a letter from the Ministry on the subject, which stated that it was understood the Council did not propose to instal both gas and electricity, and the service involving the lower capital cost was to be charged to the housing account. Mr. Fairbairn asked how much would be debited to the housing scheme if gas was put into the houses, and how much if gas and electricity were put in. Alderman Leicester said that the cost of the all-gas supply would be £384. This would be charged to the housing scheme, and would not come on the rates. If they had gas and electricity, it would cost £212 on the housing scheme and £144 on the rates. Mr. Fairbairn contended that the Government wanted to be charged with the lower sum. They objected to pay anything which they could escape. If they had all gas, it would cost £384, and if gas and electricity £356. He did not think the Government cared two straws what the Council did, provided they were charged with the lower sum. He moved an amendment that the Council agree to a gas and electric supply, providing the Ministry would allow the £356 to be charged to the housing scheme. The amendment was lost; the motion to rescind the previous resolution being carried.

The Value of Advertising.

In an address to the Gas Sales Association of New England, Mr. Floyd W. Parsons said that advertising was probably the most common activity in which civilized people are now engaged. If our ideas and knowledge concerning advertising had been as great years ago as to-day, civilization would have advanced more rapidly. Advertising is the only force that can be employed successfully to counteract the natural hostility of the public toward all radical change or innovation. People did not want the railroad; and the introduction of steam transportation was seriously delayed by the prevalence of the notion that a speed of 30 miles or more an hour would greatly hinder the free circulation of the blood. Fulton and his steamboat were held up to ridicule; and Brunel, who piloted the first steamboat on the Thames, became so unpopular that he was refused admission in the London hotels. The first sewing machine placed on exhibition by Howe was smashed by a mob. Westinghouse was called a fool by railroad experts; and Murdoch was sneered at because he suggested the use of gas for light. The public was sure there could be no lamp without a wick. To-day we know better than to try and introduce something new without first creating an understanding of the thing and a demand for it. If Morse could have used modern advertising, he would not have had to plead for years before Congress and the public in order to get attention for the telegraph. Neither would M'Cormick have had to preach efficient harvesting by word of mouth for fifteen years in his efforts to introduce the mechanical reaper. Publicity or advertising, as now conducted, would have made a market for all of these inventions in a very short time. Business history has shown that widely advertised goods are the last to feel a general industrial depression. An investigation of the business failures occurring in the United States in 1920 showed that 84 p.ct. were firms that did not advertise.

An acetylene gas generator at the Lancashire Engineering Company's works in Milnshaw Lane, Accrington, exploded last Thursday, and two men were injured. They were examining the new generator at the time of the accident.

Members of the Blackburn Technical College Chemical Society were addressed, on the 8th inst., by Mr. E. Holliday, on "Coal Gas Manufacture." The lecture was illustrated by photographs and drawings; and the speaker dealt with the latest type of vertical retorts, a number of which have recently been installed at the Blackburn Greenbank works.

THE RATES ADVISORY COMMITTEE.

On Thursday last, the Rates Advisory Committee, who are sitting at the Royal Courts of Justice to consider objections to the new proposals of the railway companies, again met. The Committee are constituted as follows: Sir Francis Gore-Brown (Chairman), Sir W. Berry, Mr. Jepson, and Mr. Lockett.

Mr. JOHN LUKES (Association of British Chemical Manufacturers) supported an objection which had been lodged in regard to coal or gas tar. He said that in the original proposals for coal or gas tar in casks or iron drums, the class suggested was No. 5. In the new proposals, the railway companies had altered that to Class 6; but in their reply to the objection made by the Association they said the traffic was placed in a sub-divisional class, corresponding to that in which it was included in the existing classification. That was Class 5, and represented a concession for 6-ton loads; so that agreed with the traders' proposals, except as regards the classification of the loads. The Association did not quite know what the railways were proposing.

Mr. PIKE (for the railway companies) said they were proposing that coal or gas tar in casks or iron drums should go into Class 6 for 6-ton loads, Class 7 for 4-ton loads, Class 10 for 2-ton loads, and Class 12 for lesser quantities.

Mr. LUKES: Then the railway companies' reply was not correct.

The CHAIRMAN said they did not seem to be reducing it below what it was before.

Mr. LUKES said they had replied that they were doing so, and the Association were hoping that they had done so. The traders were prepared to accept Class 6 in regard to trucks. With regard to loading, however, he would like to call the Committee's attention to the evidence he had given previously—that average loads were 4·15 to 5 tons.

Mr. PIKE contended that 67 p.ct. of the traffic did load over 6 tons, and went up to over 8 tons a truck.

Mr. LUKES was unable to understand Mr. Pike's figures. He could not imagine how it was possible to get more than 4 15 to 5 tons into a truck. He admitted that when a large truck was given them they could load up to 6 tons.

Mr. PIKE wished to correct what he had said. The percentage was not so high as that he had given.

The Committee decided that the minimum should be 5 tons per truck.

Mr. LUKES then dealt with the objection which had been lodged in regard to gas water and gas liquors. The traders' proposals were that, in owners' tank-wagons, 8-ton lots should be Class 1; 4-ton lots in owners' tank-wagons Class 2; e.o.h.p., 4-ton lots owners' wagons Class 3; and e.o.h.p. 4-ton lots in companies' wagons Class 5. Gas water was worth about 5s. to 6s. per ton delivered at distillers' works in distillers' tank-wagons. It would depend on the amount of ammonia the water contained, which was usually somewhere about 2 p.ct. The remainder was useless, and had to be thrown away. It passed almost entirely in owners' tank-wagons, and was sent fairly long distances. Gas water was a refuse like ashes, and the value was less than any commodity in Class 1.

The Committee decided that it should be in Class 1.

Mr. FERN (Association of British Chemical Manufacturers) asked for a concession in regard to calcium liquor in order to increase the sale of the article, which was of low grade.

It was decided that it should be in Class 6.

Mr. LUKES (Association of British Chemical Manufacturers) supported the Association's objection regarding pitch and coal tar. He said the existing classification was Class 3; and the railway companies proposed that it should go into Class 6. The proposal of the traders was: 8 ton loads, owners' tank-wagons, Class 2; 5-ton loads, owners' tank-wagons, Class 3; 4-ton loads, companies' wagons, Class 6; 6-ton loads, owners' tank-wagons, Class 5. The value of pitch was 50s. to 55s. a ton f.a.s.; but the price varied in different parts of the country. Pitch was very difficult to handle in hot weather; and they could not get men to deal with it. The bulk of it, even when sent abroad, was used for patent-fuel making. The risk was *nil*, the handling *nil*, and the loading was good. It was used principally in France, Belgium, and Spain. Except that pitch was a seasonal traffic, it passed under similar conditions to coal. The Association considered that no higher rates should be charged than those applicable to fuel.

Mr. PIKE said the exceptional rates had been granted according to the particular circumstances of the case, and it would not be possible to reflect those in classification. If Mr. Lukes thought they could carry pitch from Lancashire to South Wales under existing conditions at anything like 7s. a ton, he was mistaken. In one week the British railways carried 17,630 tons of pitch, and 97 p.ct. of it was over 8 tons per truck. Roughly, it worked-out at about 10 tons per truck.

The Committee's decision was that this should go into Class 6.

Mr. LUKES asked for a classification for crude anthracene the same as creosote salts. He mentioned that there was a very limited sale for anthracene crude. The traders' proposal was: In casks, companies' wagons, 4 tons, Class 8; in bags in owners' wagons, 4 tons, Class 6. The value of this traffic was from £8 10s. to £13 per ton at distillers' works. The traffic was very similar to industrial chemicals shown on pages 40 and 41 of the railway companies' proposals—in fact, some of the traffic on those pages was higher.

Mr. PIKE quoted the price for crude anthracene given in one of the trade journals as at Feb. 3. He said they preferred to carry it in casks rather than sacks, because of its peculiar staining quality.

Mr. LUKES quoted at some length the prices of crude anthracene from the "GAS JOURNAL."

The Committee decided that crude anthracene in casks should be put in Class 11; in sacks, owners' wagons, covered with owners' sheets, Class 10.

Mr. LUKES, on the subject of anthracene e.o.h.p., said this was known as pure anthracene. They asked that it should be put in Class 16, and the Committee decided that it should be in this class.

The Committee decided that naphthalene should be in Class 11 generally, and in Class 10 when in owners' wagons.

Mr. LUKES' application that fuel oil, creosote pitch mixture, should be considered later with oils was agreed to by the Committee.

TRADE NOTES.

Pressed-Steel Tanks.

Messrs. Thomas Piggott & Co., Ltd., of Atlas Works, Spring Hill, Birmingham, have recently secured an order for one of their patent pressed-steel tanks 140 ft. long by 48 ft. wide by 12 ft. deep. This sectional steel tank will be the largest yet built, and will have a capacity of 500,000 gallons. In the particular case in which this tank is to be used, the circumstances are such that within a few months the tank, after serving a specific purpose, will require to be removed and re-erected as two or more tanks. The firm's tank plates, being arranged for unit construction, will readily permit of this being carried out. Though the special conditions mentioned had to be taken into account, the cost delivered and erected made it possible to take into consideration these special conditions without unreasonable expense, and, more important still, without increasing the price beyond competitive systems of construction, which, in some cases, would have had no scrap value, or any value, after being put out of commission.

The Kestner Water-Tube Boiler.

Having just taken up the manufacture of the Kestner patent water-tube boiler, Messrs. Ransomes, Sims, and Jefferies, Ltd., of Orwell Works, Ipswich, have prepared an illustrated pamphlet descriptive of the boiler and of the advantages claimed for it. This invention of M. Paul Kestner is already well known to steam users throughout Europe; and the pamphlet tells us that the installations in Great Britain are, without exception, giving the very highest satisfaction to every one concerned. The boiler possesses the following characteristics: (1) All the tubes are heated equally, and produce equal evaporation; they all expand uniformly, and with complete freedom. (2) They receive the greatest heat at the bottom, where there is more water, while at the top they are only submitted to a moderate heat. (3) The circulating tubes, on which the circulation depends, are not directly heated by the gases, and do not produce steam. It is only necessary to remove two manhole covers to gain access to the boiler interior for inspection and cleaning; while access may also be had to the exterior portion of the tubes through a number of openings. It is pointed out that the Kestner boiler is specially suitable for gas firing; and though the conditions required for the combustion of gas and coal are not the same, the boiler can, when necessary, be so arranged that, at will, it can be operated with coal or gas, or with both simultaneously—an extra chamber being provided for the combustion of gas. The Kestner boiler is also claimed to be specially suitable for utilizing waste heat from the many industrial processes where large volumes of gas at a suitable temperature are available for steam-raising purposes. It is very compact, and therefore the floor space required for a given output is relatively small.

CURRENT SALES OF GAS PRODUCTS.

Tar Products in the Provinces

Feb. 13.

The average values for gas-works products during last week were: Gas-works coal tar, 32s 6d. to 37s. 6d. Pitch, East Coast, 66s. to 68s. f.o.b.; and 64s. to 66s. f.a.s. West Coast—Manchester, 60s. to 62s. 6d.; Liverpool, 60s. to 62s. 6d.; Clyde, 62s. 6d. to 65s. Benzole 90 p.ct. North, 2s. 2d. to 2s. 3d.; crude 65 p.ct. at 120° C., 1s. 7d. to 1s. 8d. naked at makers' works; 50-90 p.ct., naked, North, 2s. 2d. to 2s. 3d. Toluole, naked, North, 2s. 3d. to 2s. 6d. nominal. Coal tar crude naphtha in bulk, North, 9¼d. to 10¼d. Solvent naphtha, naked, North, 2s. 2d. to 2s. 5d. Heavy naphtha, North, 2s. 1d. to 2s. 3d. Creosote, in bulk, North, liquid, 4¾d. to 5d.; salty, 4¼d. to 4¾d. Scotland, 4¾d. to 4¾d. Heavy oils, in bulk, North, 6¼d. to 6¾d. Carbolic acid, 60 p.ct., 1s. 9d. Naphthalene, £12 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 5d. to 6d. per minimum 40 p.ct.; "B" unsaleable.

FROM A MARKET CORRESPONDENT.

Bye-Products Trade.

These materials remain without much alteration, although in many lines an upward tendency is to be noted, together with a small increased volume of business. The market for pitch is firmer on a good demand; the latest quotations being in the neighbourhood of 65s. per ton. Naphthalenes experience only small inquiry; crudes remaining at from £5 to £8 per ton, and refined at from £15 to £18. Solvent naphtha is rather cheaper at about 2s. 3d. per gallon on rail. There is not much inquiry for pure benzole, which is quoted at from 2s. 11d. to 3s. 1d.; while 90's is fairly plentiful at 2s. 5d. Creosote is on the weak side without much business passing, and can be bought at about 5d. per gallon. Cresylic acid is also fairly plentiful. Pale 97/99 p.ct. is quoted at 2s., with dark 95/97 p.ct. at 1s. 9d. to 1s. 10d. per gallon. Carbolic acid remains practically unsaleable at 1s. 4d. per gallon for crude and 4½d. per lb. for crystals. In intermediate products, a rather better tendency is to be noted on both home and export account. Aniline oil and salts are inquired for at 1s. 1d. and 1s. 2d. per lb. respectively. Salicylic acid, technical grade, can be obtained at 1s. per lb. Beta naphthol is 2s. per lb.; but an advance on these prices is anticipated in the near future. Resorcin, technical grade, is 6s. per lb.

Sulphate of Ammonia.

The position of this material has somewhat improved since my last report, on account of the placing of a fair number of orders. At the same time it is fairly clear that the home trade will not take so much sulphate this year as formerly; but as there is not so much being produced owing to the coke-ovens being closed down, this will not matter greatly so long as the export demand remains fairly good. Of late, however, the export trade has shown a slight decline; and this, coupled with a renewed activity at the coking plants which, we understand, is likely to take place shortly, promises a further supply for home requirements. The Board of Trade returns for January show

that during that month 16,854 tons, valued at £266,380, were exported. France was the largest customer, with 8129 tons to her credit, followed by the Dutch East Indies, with 4488 tons, Spain and the Canaries with 1564 tons; while to Japan, our best pre-war customer, only 50 tons were exported (valued at £650), compared with 2894 tons in January, 1920, valued at £63,740. From America comes the information that home users are anxious to obtain material which was sold during the recent price-cutting campaign to overseas markets. Sulphate is comparatively scarce in America; production being sold up for months ahead, and it is consequently argued that the opportunity for which the holders of nitrate of soda have been waiting has arrived, and that fertilizer consumers will consequently use a great deal of nitrate of soda in the coming season of application.

Position of Ellesmere Council Gas Undertaking.

The Clerk to the Ellesmere Urban Council (Mr. H. R. Giles) reported to a meeting of that body last week that the position with regard to the gas-works was a serious one. The debit balance at the bank was, he said, £544, and cheques to be drawn and payments to be made for other items brought the total up to £1671. Setting-off receipts, there would be an estimated total debit balance at the end of the financial year of £912. There was over £550 now owing for coal supplied up to Christmas; and he mentioned that he had recently taken upon himself to write to the Treasury, calling attention to the serious position in which the Council had been put owing to the coal strike. For two months there was no gas consumption; and then the high price of coal followed. He had asked if they would allow an overdraft of about £750, to put the Council right. In the debit balance of £912, he pointed out, was included an account for slot-meters and gas-cookers for new houses, which the Ministry would not allow to be debited against the housing scheme. He was, however, hoping that they would get sanction for a loan on the cookers, which would then bring them down to practically £750. He further stated that he had made out a statement which he had forwarded to the Ministry of Health showing the receipts and expenditure for the last three years, as follows: For the year ended March 31, 1919, the expenditure was £1953, and receipts £1595—loss £358. For year ended March, 1920, expenditure £2257, receipts £2048—loss £208. For the year ended March, 1921, expenditure £3017, receipts £2705—loss £312. In three years, the total loss was £878. The overdraft at Dec. 1, 1921, was £678, and on Jan. 26 this year £563; and this notwithstanding the increase in the price of gas. The Chairman of the Council (Mr. B. R. C. Tower) said it had always been a great struggle; and the gas-works had never been an asset to the Council. Eventually it was decided that a special meeting of the Council should be called to consider the question, as soon as the Clerk received a reply to his letter to the Ministry. The Clerk said he had worked out various figures; and he was under the impression that a large amount of gas was lost through leakage.

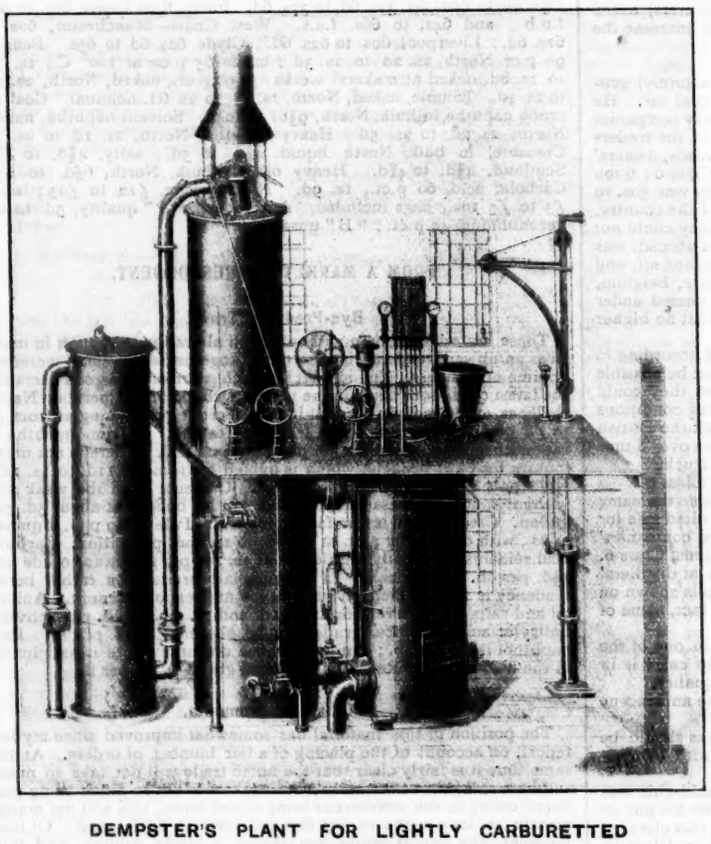
APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Feb. 8.]

Nos. 2668 to 3363.

ABBOTT, A. P.—"Conveyors or elevators." No. 3316.
ABBOTT, A. P.—"Water-gas recorder." No. 3355.
BARCLAY, A.—"Heat guide for use with cooking, &c., utensils." No. 2787.
BEAMES, H. P. M.—"Liquid-fuel burner for crude and residual oils." No. 3153.
BUDDLE, L. J.—"Hot-plates for heating and cooking." No. 2702.
BULLINGER, T.—"Process of oxydizing hydrocarbons." Nos. 2739, 2740.
CONTI, J. T. F.—"Safety syphon for automatic closure of gas-piping when pressure falls below a given value." No. 2767.
COWELL, F. W.—See Barclay, A. No. 2787.
CUNLIFFE, J. A.—See Abbott, A. P. No. 3355.
FLINT, R.—"Gas-tap safety attachment." No. 2838.
GAIGER, E. S.—"Combination handle for gas-lighters, &c." No. 2846.
GROVER, F. M.—See Beames, H. P. M. No. 3153.
GUEST AND CHRIMES, LTD.—"Mechanism for obtaining intermittent rotary movements from rotary mechanism." No. 2978.
IRONSIDE, T. G.—"Distilling oil shales, coal, &c." No. 2729.
JOHNS, W. H.—See Abbott, A. P. Nos. 3316, 3355.
KEITH, C.—See Keith and Blackman Company, Ltd. No. 3083.
KEITH AND BLACKMAN COMPANY, LTD., J.—"Cover for furnaces." No. 3083.
LEE, E.—"Gas-heated stands for laundry irons, &c." No. 3168.
PITHER, G.—See Barclay, A. No. 2787.
ROXBURGH, A. B.—"Gas grilling, toasting, &c., apparatus." No. 3253.
SULZER FRÈRES SOC. ANON.—"Apparatus for utilizing heat from incandescent coke." No. 2719.
SULZER FRÈRES SOC. ANON.—"Plants for cooling incandescent coke." No. 2720.
TEICHNER, G.—See Bullinger, T. Nos. 2739, 2740.
WINTERNITZ, H.—See Bullinger, T. Nos. 2739, 2740.

Wellington and Oakengates Gas Supply.—A scheme to be carried out during the summer or autumn at Wellington (Salop) is the pipe-laying from the Wellington Gas-Works to Oakengates, as the result of the amalgamation of the Wellington and Oakengates Gas Companies. It appears that the gas supply for the district will be from the Wellington works, where there is a modern plant installed at considerable expense, capable of producing gas for a much larger area than Wellington or Oakengates combined.



DEMPSTER'S PLANT FOR LIGHTLY CARBURETTED WATER GAS.

DEMPSTER'S
COMBINATION OF
BLUE AND CARBURETTED WATER GAS PLANTS

THE BEST FOR EFFICIENT AND ECONOMIC RESULTS.

R. & J. DEMPSTER, LD.,
GAS PLANT WORKS,
MANCHESTER.

Telephones: 54 and 2296 CENTRAL.
LONDON TELEPHONE: VICTORIA 7426.

Reduction in Price for Power at Walsall.—The Walsall Gas Committee have had under consideration the price to be charged for gas for power purposes, and have agreed that, if the consumption is over 1,000,000 c.ft. per quarter, a reduction of 3d. per 1000 c.ft. should be made in the price for the time being; and if over 2,000,000 c.ft. per quarter, a reduction of 4d. per 1000 c.ft.

A Further Reduction at Oldbury.—At the meeting of the Oldbury District Council on the 1st inst., approval was given to a recommendation of the Gas Committee that the price of gas should be further reduced as from Jan. 1 by 2d. per 1000 c.ft. to all consumers. This is in conformity with the policy of the Committee of passing on to the consumer without delay all the benefits to be obtained in the way of reduction in costs of production, so as to give the greatest possible impetus to a revival of trade, and is the third reduction in price which has been announced within the past four months. Certain alterations in salaries paid by various departments were also approved.

The Kidsgrove Gas Company have addressed a letter to the Audley Urban Council, asking the Council to send a plan showing the limits of the boundary within which they desire to supply gas. It was, however, decided to ask the Gas Company to receive a deputation upon the matter.

It is probable that the price of gas in Birmingham will be further lowered at the end of the present quarter. To day it is 5s. per 1000 c.ft.; and it is anticipated, Mr. A. W. Smith (the Manager of the Gas Department) states, that the fall will be 6d. per 1000 c.ft. In January a similar reduction was made—the price then being 5s. 6d.

Owing to the presence of coal gas in a Birmingham sewer, a Corporation workman named Ronald Price, of Balaclava Road, King's Heath, had a singularly unpleasant experience on Tuesday last. He had placed a fire bucket on a manhole, when there was a loud report. The roadway was blown up for some distance; and the man fell heavily to the ground, breaking an arm.

STOCK MARKET REPORT.

THE Stock Exchange has had a week more cheerful than its predecessor; the gilt-edged market being especially firm. Home Government issues throughout the list were strong. All the big four advanced, Friday's figures being: Consols 52¼-52⅝, War Loan 93¾-94, Funding 79⅛-79¾, Victory 84-84⅝, and Bonds were in good demand.

Business in the Gas Market added another chapter to its very agreeable history of the past few weeks. In the big companies, the volume of whose stocks is sufficiently large to afford scope for daily transactions, dealings were brisk. In the London Companies, all three Gas Lights, South Metropolitan, and both Commercials advanced. In the Suburban and Provincial group, Brentford "A" and "B" rose 2 each, British 1, Ilford "A" and "B" 15, ditto "B" 21, South Suburban 3, and the six Wandsworths 1 each. In Foreign, European was higher, and Imperial Continental 3. Primitiva shares were not dealt in; but some of the debenture issues changed hands at good prices.

Bargains done for cash during the week were as follows: On Monday, British 27⅜, Commercial 4 p.ct. 64, ditto 3½ p.ct. 62, Croydon "C" 128, 129, European 8¼, 8⅛, Gas Light ordinary 72½, 72⅝, 73, 73¼, 73⅜, 73½, ditto maximum 54½, 55, 55¼, ditto preference 68, 69, 70⅛, Imperial Continental 132½, 132⅝, 133, 133½, ditto debenture 65, Lea Bridge 74, Liverpool 69½, Primitiva debenture 74½, South Metropolitan 78, 78¼, 78⅜, ditto debenture 54, 55, ditto 6½ p.ct. debenture 104⅜, South Suburban debenture 75½, 78, Wimbledon 60, 60½, Liverpool 7 p.ct. preference 102, ditto £30 paid 31½-32. On Tuesday, Bournemouth "B" 8 15/16, 9 1/16, Brentford "B" 83½, 84½, European 8 1/16, Gas Light ordinary 73⅛, 73½, 73½, 73¾, 74, Imperial Continental 132½, 132⅝, 133, 133½, Primitiva debenture 74¼, South Metropolitan 78½, 78⅝, 78¾, 79, South Suburban debenture 77, ditto 7 p.ct. debenture 100, Liverpool 7 p.ct. preference 101½, 102, ditto £30 paid 31½-32½, Southgate District 71½. On Wednesday, Brentford "A" 84½, European 8⅜, 8½, Gas Light ordinary 73½, 74, ditto maximum 55¼, ditto preference 70½, 70¾, Imperial Continental 133½, 133⅝, 134, ditto debenture 65, Primitiva 1911 debenture 51¼, River Plate 53⅝, 53¾, 54, South Metropolitan 78, 78⅛, 79, South Suburban 84, Wimbledon 60, Epsom 60, Croydon 10 p.ct. "E" 115, 115½, Liverpool 7 p.ct. preference 102, ditto £30 paid 32-32½. Worthing 5 p.ct. 55, 55½. On Thursday, Brentford "A" 82, Commercial 4 p.ct. 63, 65, ditto 3½ p.ct. 63, European 8, 8¼, Gas Light ordinary 73⅛, 73⅜, 74, 74¼, 74⅜, Imperial Continental 134½, 135½, 136, Oriental 86¼, Primitiva 1911 debenture 54, South Metropolitan 77¼, 78⅛, ditto 6½ p.ct. debenture 104, South Suburban 86, 86¼, Epsom 62, Liverpool 7 p.ct. preference 102½, ditto £30 paid 31½-32½. On Friday, Brentford "A" 83, European 8⅛, Gas Light ordinary 73⅜, 74⅛, 74¼, 74½, 74⅜, ditto maximum 54½, ditto preference 70, ditto debenture 54, 55, Hong Kong and China 5⅝, Imperial Continental 134, 135, 135½, 137, ditto debenture 64⅜, South Metropolitan 76, 76½, 76⅝, 77, 77¼, 77½, 78, ditto 6 p.ct. debenture 103½, South Suburban 86, 86½, 87, Tottenham "B" 78, Liverpool 7 p.ct. preference £30 paid 31⅛-32½, Ottoman preference 30s.

In the Money Market, the condition of extreme ease which marked the close of the previous week was maintained in full action. Accommodation could be had upon the lowest imaginable terms, and discount rates were almost nominal. Silver was easy, touching 34½ in midweek. The Bank rate is 5 p.ct., as fixed on Nov. 3.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Aug. 26	4	4%	Aldershot 4 p.c. Pref.	...	30—35	...
1,551,868	,,	Oct. 13	9½	3½%	Alliance & Dublin Ord.	39—64	52—55	...
574,000	,,	Jan. 12	4	4%	Do. 4 p.c. Deb.	76—79	46—51	...
280,000	5	Nov. 30	7½	4/—	Bombay, Ltd.	5⅛—6⅛	5⅛—5⅜	...
100,000	5	Aug. 11	16	4/7½		...	7⅛—8⅛	...
585,110	10	,,	7	7/—	Bournemouth Gas & Water { B 7 p.c.	15—15½	8⅛—9⅜	8 1/16—9 1/16
115,000	10	,,	6	6/—	Pref. 6 p.c.	13½—14	7⅛—8⅛	
162,065	—	Dec. 30	—	4%	4 p.c. Deb.	...	60—65	...
992,045	Stk.	Feb. 9	14	56/—	Brentford A Consolid.	261—266	80—85*	82—84½
734,920	,,	,,	11	55/—	Do. B New	204—209	80—85*	82½—84½
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	66—70*	...
221,400	,,	Dec. 15	4	4%	Do. 4 p.c. Deb.	91—93	60—62	...
214,775	,,	Aug. 26	11	10½%	Brighton & Hove Orig.	208—213	132—137	...
244,200	,,	,,	8	7½%	Do. A Ord. Stk.	154—159	92—97	...
1,287,500	Stk.	July 28	5	5%	Bristol 5 p.c. max.	...	...	...
550,000	20	Sept. 29	12½	10%	British	44—45	26—28	27½
120,000	Stk.	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	58—90	59—64	...
243,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	50—55	...
100,000	10	May 27	—	6%	Cape Town & Dist., Ltd.	1½—2½	6—7	...
100,000	10	Oct. 28	—	4½%	Do. 4½ p.c. Pref.	4—6	4½—5½	...
100,000	Stk.	Dec. 30	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	56—60	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	...	...
1,513,280	,,	July 28	5/9/4	42/8	Commercial 4 p.c. Stk.	105—108	62—67	63—65
560,000	,,	,,	5½	38/4	Do. 3½ p.c. do.	103—105	62—67	62—63
475,000	,,	—	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	47—50	...
800,000	,,	Dec. 15	4	—	Continental Union Ltd.	76—79	18—20	...
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	33—38	...
51,600	,,	Aug. 26	15	15%	Croydon A 10 p.c.	...	160—165	...
278,400	,,	,,	12	12%	Croydon B and C 7 p.c.	...	125—130	128—129
492,870	Stk.	—	6	4½%	Derby Con. Stk.	123—125	...	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	...	...
1,002,180	10	Jan. 26	10	3/0	European, Ltd.	17½—18	8½—8⅝	8—8½
16,298,975	Stk.	Aug. 11	4/17/4	46/8	Gas 4 p.c. Ord.	98—102	73—75	72½—74⅜
2,600,000	,,	,,	5½	55/—	Light 5½ p.c. max.	76—79	53—56	54½—55½
4,062,255	,,	,,	4	4%	and 4 p.c. Con. Pref.	96—99	69—72	68—70½
4,674,850	,,	Dec. 15	5	5%	Coke 5 p.c. Con. Deb.	72½—74½	53—55	54—55
150,000	,,	Dec. 11	10	10%	10 p.c. Bonds.	...	...	...
82,500	,,	Sept. 14	5	5%	Hastings & St. L. 5 p.c.	...	...	...
258,740	,,	,,	5½	2½%	Do. 5½ p.c.	87—89	45—55	...
70,000	10	May 12	11	5%	Hongkong & China, Ltd.	16½—16¾	5½—6½	5⅛
86,600	Stk.	Aug. 26	9	9½%	Hornsey 7 p.c.	...	100—105	...
151,000	,,	July 28	7½	7½%	Ilford A and C	151—154	100—105	...
65,780	,,	,,	6½	5½%	Do. B	115—118	85—90	...
65,500	,,	Dec. 30	4	4%	Do. 4 p.c. Deb.	92—94	60—65	...
1,976,000	,,	Oct. 28	9	5%	Imperial Continental	150—160	133—138	132½—137
1,255,000	,,	Feb. 9	5½	3½%	Do. 3½ p.c. Deb. Red.	64—66	65—68*	64½—65
255,242	,,	Aug. 26	6½	6½%	hea Bridge Ord. 5 p.c.	119—121	73—75	74
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord.	211—213	...	69½
306,083	,,	June 26	4	4%	p.	146—148	...	...
165,736	,,	Aug. 11	7/5/6	6%	Do. 4 p.c. Pr. Deb. Stk.	...	...	...
63,480	,,	Dec. 30	—	5%	Maidstone 5 p.c.	...	54—56	...
75,000	5	June 11	6	3%	Do. 5 p.c. Deb.	...	40—43	...
250,000	100	Oct. 3	4½	4½%	Malta & Mediterranean	4¼—4⅜	2—2½	...
341,920	Stk.	Nov. 30	4	4%	Melbourne 4½ p.c. Deb.	99—101	93—100	...
1,875,892	,,	July 28	4½	3%	Monte Video, Ltd.	11½—12	53—58	...
529,705	,,	Dec. 30	5½	5½%	Newcastle & Gatsh'd Con.	98½—99½	67—69	...
15,000	10	Aug. 26	—	7/6	Do. 4½ p.c. Deb.	82—83	50—52	...
55,940	10	,,	7/14/0	5/3	North Middlesex 10 p.c.	...	12½—13	...
300,000	Stk.	Dec. 15	8	8%	,, ,, 7 p.c.	14—15	7½—8½	...
60,000	5	—	10	—	Oriental, Ltd.	117—122	84—87	86½
188,120	Stk.	Dec. 30	—	6%	Ottoman, Ltd.	7½—7⅝	2—3	...
60,000	50	Aug. 26	15	60/—	Plym'th & Stoneh'se 5 p.c.	...	69—71	...
100,000	50	,,	12	55/—	Portsea Island, B	128—131	74—77	...
849,980	5	—	8	—	Do. C	118—121	51—54	...
499,960	5	—	5	—	Primitiva Ord.	5⅛—6	⅛—⅜	...
521,600	100	Dec. 1	4	4%	Do. 5 p.c. Pref.	4½—5	1½—2½	
600,000	Stk.	Jan. 26	4	4%	Do. 4 p.c. Deb.	91—95	74—76	74½
546,198	,,	Dec. 30	4	4%	Do. ,, ,, 1911	...	50—55	51½—54
150,000	10	Sept. 29	6	6/—	River Plate 4 p.c. Deb.	85—87	50—55	53⅜—54
125,000	50	Jan. 3	5	5%	San Paulo { 6 p.c. Pref.	10½—11	6—6½	...
135,000	Stk.	Aug. 26	10	5%	{ 5 p.c. Deb.	47—49	35—38	...
209,984	,,	,,	10	5%	Sheffield A	225—234	68—70	...
525,500	,,	,,	10	4½%	Do. B	222—234	68—70	...
155,201	Stk.	Sept. 15	4	4%	Do. C	220—232	68—70	...
90,000	10	Oct. 28	9	8%	Shrewsbury 5 p.c.	...	...	...
6,809,895	Stk.	Feb. 9	5/4/0	5%	South African	10½—11½	7—9	...
250,000	,,	Jan. 12	—	5%	South Met. Ord.	111—113	76—78*	76—79
1,895,445	,,	,,	3	3%	Do. Red. Pref.	...	94—96	...
224,820	,,	Dec. 15	8½	4½%	Do. 5 p.c. Deb.	73½—74½	51—54	54—55
1,087,795	,,	Aug. 11	6	5½%	South Shields Con. Stk.	137—139	86—88	...
368,837	,,	Dec. 30	5	5%	S'th Suburb'n Ord. 5 p.c.	114—116	83—88	87—87
647,740	,,	Nov. 16	7½	4%	Do. 5 p.c. Deb. Stk.	116—118	74—77	75½—78
121,275	,,	Dec. 30	4	4%	Southampton Ord.	99—102	57—60	...
120,000	,,	Aug. 11	—	6%	Do. 4 p.c. Deb. Stk.	...	58—60	...
982,275	,,	,,	6	4½%	Tottenham { A 5 p.c.	135—138	88—93	...
181,255	,,	Dec. 15	4	4%	District { B 5½ p.c.	115—117	75—80	78
182,580	10	Dec. 30	5	—	{ 4 p.c. Deb.	87—89	62—67	...
149,900	10	July 1	5	5%	Tuscan, Ltd.	3—6	1—2	...
256,476	Stk.	Aug. 26	5	5½%	Do. 5 p.c. Deb. Red.	93—95	45—50	...
					Tynemouth 5 p.c. max.	108½—109	67—69	...
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Aug. 11	8½	66/3	Wandsworth A 5 p.c.	151—156	82—84	...
255,636	,,	,,	6½	51/3	Do. B 5½ p.c.	129—134	63—65	...
108,075	,,	,,	—	46/4½	Do. C	...	60—62	...
140,865	,,	,,	—	46/4½	New Ordinary	...	60—62	...
352,000	,,	,,	6½	45/—	Wimbledon 5 p.c.	117—122	60—62	60—60½
98,000	,,	,,	6½	50/—	Epsom 5 p.c.	121—126	60—62	60—62
88,416	,,	Dec. 30	4	5%	4 p.c. Deb. Stk.	66—69	50—55	...

* Ex Div.

Royal 8vo., Cloth, Gilt Lettered, Price 15s. Net.

Clauses and Precedents in

ELECTRICITY, GAS, & WATER LEGISLATION.

Being a Comparison of the Provisions contained in the Model Bills, in Special and Municipal Acts, and in Provisional Orders, 1910 to 1914, relating to these Public Services.

Compiled and noted by

JACQUES ABADY,

of the Middle Temple, Barrister-at-Law.

WALTER KING, LIMITED, "JOURNAL" OFFICES, 11, BOLT COURT, FLEET STREET, LONDON, E.C. 4.

THE THERM PRICE CALCULATOR

(Protected.)

A SLIDE RULE designed by Mr. H. R. ASKEW, Assoc.M.Inst.C.E., B.Sc. (Eng.), &c., for quickly and accurately converting "Price per Thousand" into "Price per Therm," and *vice versa*.

AN INVALUABLE ADJUNCT TO EVERY GAS OFFICE.

For Description, see "JOURNAL," Jan. 12, 1921, p. 88.

Price 10/6, post free.

Walter King, Limited, "JOURNAL" Offices, 11, Bolt Court, Fleet Street, LONDON, E.C. 4.

Distribute the "GAS SALESMAN" Monthly Supplement

Among your GAS SALES STAFF.

Separate copies of each issue will be printed. No. 1 was published with the "JOURNAL" for January 25.

Price per 100, 35s.; 50, 18s.; per doz., 4s. 6d.—plus postage; single copies, 5d. (Stamps for single copies with order).

WALTER KING, LTD., "GAS JOURNAL" OFFICES, 11, BOLT COURT, FLEET STREET, LONDON, E.C. 4

THE SOCIETY OF BRITISH GAS INDUSTRIES DIRECTORY, 1921.

JUST PUBLISHED, **Price £1 1s.,** POST FREE.

Size 12 in. by 9⅓, Cloth Bound, Printed on Art Paper, and containing 400 pp.

The aim of the Directory is to provide, within the covers of a Single Book, in a readily available form, information now contained in numbers of Individual Catalogues. The book also contains the Text of the Standard Specifications for Refractory Materials and the Standard Conditions of Contract adopted by the Institution of Gas Engineers; certain of the Specifications issued by the British Engineering Standards Association; and a number of Engineering Formulæ and Tables, &c., &c.

COPIES MAY BE OBTAINED FROM

WALTER KING, LIMITED, "GAS JOURNAL" OFFICES, 11, Bolt Court, Fleet Street, London, E.C. 4.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer—not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON TUESDAY, to ensure insertion in the following day's issue.

Orders to Alter or Stop PERMANENT ADVERTISEMENTS should be received by the FIRST POST on Monday.

UNDISPLAYED ADVERTISEMENTS: Situations Wanted, Six Lines and under (about 36 words) 3s.; each additional Line, 6d. Situations Vacant, Apparatus Wanted and for Sale, Contracts, Public Notices, &c., 9d. per Line—minimum, 4s. 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

		ONE YEAR.	HALF-YEAR.	QUARTER.
United Kingdom	Advance Rate:	35/-	18/-	10/-
	Credit Rate:	40/-	21/-	11/6
Abroad (in the Postal Union) Payable in Advance		40/-	22/6	12/6

In payment of subscriptions for "JOURNALS" sent abroad, Post Office Orders or Bankers' Drafts on London only are accepted.

All Communications, Remittances, &c., to be addressed to WALTER KING, LIMITED, 11, BOLT COURT, FLEET STREET LONDON, E.C. 4.

Telegrams: "GASKING, FLEET LONDON." Telephone: Holborn 6857.

OXIDE OF IRON

FOR SALE OUTRIGHT, OR ON LOAN.

SPENT OXIDE

PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LTD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.2.

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for Gas-Works.
ANDREW STEPHENSON, Gresham House, Old Broad Street, LONDON, E.C. "Volcanism, London."

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E. 1.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams—
"BRADDOCK, OLDHAM," and "METRIQUE, LAMB, LONDON."

HIGH-PRESSURE DISTRIBUTION.

COMPLETE Tables for Flow of Gas in Mains, at all Pressures from ¼ inch to 100 lbs.
Many other useful PRESSURE TABLES.
See "DISTRIBUTION BY STEEL" (Woodall and Parkinson), SECOND EDITION 15s. 9d., Post Free, BENN BROS., LTD., 8, Bouverie Street, LONDON, E.C.4.

OXIDE OF IRON.
SPENT OXIDE BOUGHT.
BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C.3.
Phone: Minories 1484.

"TORTO" FIRE CEMENT.
BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C.3.
Phone: Minories 1484.

"KLEENOFF," THE COOKER CLEANSER.
Tins for Sale to Consumers.
In Bulk for Works Use.
BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C.3.
Phone: Minories 1484.

(Continued on p. 408.